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1947

THE ACADEMY OF NATURAL SCIENCES
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PHILADELPHIA
THE ACADEMY OF NATURAL SCIENCES
1947

This One



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NOTES ON THE PHASMID GENUS *ISAGORAS* (ORTHOPTERA:
PHASMATIDAE: PSEUDOPHASMATINAE), WITH
THE DESCRIPTION OF SIX NEW SPECIES

BY JAMES A. G. REHN

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The genus *Isagoras* was erected by Stål in 1875¹ on the species called *Metriotes obscura* by Westwood,² which, as Westwood shows was originally described by Guérin-Méneville as *Phasma obscurum*,³ and was known to the former only through the latter's description and figure. In consequence the genotype of *Isagoras* is *Phasma obscurum* Guérin-Méneville. Redtenbacher in "Die Insektenfamilie Phasmiden"⁴ considers the latter to be a synonym of Gray's earlier *Platycrana rugicollis*.⁵ Redtenbacher had before him neither of the types of Gray or Guérin-Méneville, nor as far as known topotypic material of either, and thus whether this synonymy is correct remains for the future to determine.

In the monographic "Insektenfamilie Phasmiden", Redtenbacher included eleven species in the genus *Isagoras*, five of which were then described as new. Of the six previously known species included by Redtenbacher, he had seen no material of three, and as subsequent studies have shown at least one of his new ones (*plagiatus*) and his interpretation of an older one

¹ Recensio Orthopt., III, pp. 59, 98.

² Catal. Orth. Ins. Brit. Mus., I, p. 160, (1859).

³ Magasin de Zoologie, VIII, Ins. Voy. de la Favorite, p. 72, pl. 235, (1838). [♀; Bahia, Brazil.]

⁴ I, p. 135, (1906).

⁵ Synops. Phasm., p. 38, (1935). [♂ (according to Westwood); Rio de Janeiro, Brazil.]

(*phlegyas*) were clearly composite.⁶ In addition it has been pointed out by Hebard that Redtenbacher's *Xerosoma vignieri* is a member of the genus *Isagoras*, and perhaps other species assigned to other genera will in the future be found to be members of this genus. Such rearrangement and reassignment, unfortunately, must be expected in the restudy of the many inconsistencies and shortcomings of this great work, which, due to its superficiality, in many respects has retarded instead of augmenting investigations on these insects.

It may be found necessary, as our knowledge amplifies, to divide *Isagoras*, as here used, into two or more generic entities, but before doing so I would wish to know more about certain eastern Brazilian species which are as yet known to me only from the literature.

Hebard, who has described most of the new species of *Isagoras* made known since Redtenbacher's work was published, in 1933⁷ presented a key to the species of the genus known to him from adult males, and this is most useful in that it brings out particularly certain features which seem to be of special value in grouping the species on the basis of the male sex. In the present state of our knowledge the preparation of a new key to include the forms here described would serve little purpose, as material of the bulk of the species considered by Redtenbacher is not now available, although almost all of them are quite distinct from the new species here presented. I now have before me the types of all four species of the genus described by Hebard (*chocoensis*, *apolinari*, *ecuadoricus* and *chopardi*) and paratypes of Chopard's *affinis*.

The inciting cause of the present study was a request for the determination of certain material secured in the Canal Zone and Costa Rica by Drs. Franz Schrader and Sally Hughes-Schrader, of Columbia University, in the course of cytological investigations of certain species of Manteidae and Phasmatidae. Two recognizable species of *Isagoras* were included, both of which proved to be undescribed. This inquiry led to the assembly from the Academy collection of other undetermined material of the genus, with the results here presented. In addition, at least two other undescribed species of the genus from Costa Rica, represented only by immature individuals, must await the acquisition of adult specimens before being characterized.

While, as mentioned above, the generic integrity of what is here considered *Isagoras* cannot be assured, broader discussion along these lines will require a knowledge of both sexes, and of more species than are at present available. Briefly, however, it seems warranted as a preliminary to group the species in four categories, i.e.: 1, those with non-lobate limbs and having

⁶ See Hebard, Trans. Amer. Entom. Soc., XLVII, p. 164, (1921); Hebard, Trans. Amer. Entom. Soc., LIX, p. 35, (1933).

⁷ Trans. Amer. Entom. Soc., LIX, pp. 35-38.

the subgenital plate of the male without lateral arms; 2, those with non-lobate limbs and having lateral arms to the subgenital plate of the male; 3, those with the dorsal margin of the caudal femora multilobate; and 4, those with a single proximal lobation dorsad and ventrad on the caudal femora.

Of the species now before me, *I. apolinari* and *ecuadoricus* Hebard, and *sauropterus*, *venezuelae* and *bishopi* here described, belong in the first category; in the second belong *chopardi* Hebard, *affinis* Chopard and *metricus* here described; in the third category I would place *subaquilus* here described; and in the fourth *schraderi* also here described. Tentatively I would put *santara* and *phlegyas* (Westwood), *brevipes* and *plagiatus* Redtenbacher, *obscurus* (Guérin-Méneville), *jurinei* (Saussure), and *kheli* (Bolivar) in sections 1 or 2, depending on characters of the male not given in the published descriptions. Günther's *tacanae* would probably fall in section 1. In section 3 would fall *proximus* and *dentipes* Redtenbacher, and very likely *vignieri* (Redtenbacher), although the limb characters of its adults are not quite clear. Where *nitidus* Redtenbacher and *venosus* (Burmeister) should be placed is problematical.

Isagoras sauropterus⁸ new species

Figs. 1-4.

More nearly related to *I. ecuadoricus* Hebard,⁹ with the type of which it has been compared, than to any previously known species. From *ecuadoricus* the present species differs chiefly in its appreciably shorter limbs, arrangement of ocelli, shorter and less acutely granulose mesonotum, lower tegminal nodes, more open and regular tegminal venation, more produced and acuminate male cerci, and the non-carinate condition of the ventral surface of the male subgenital plate. From Günther's *I. tacanae*¹⁰ this species can be separated by a number of features, the more obvious of which are its distinctly smaller size, the simpler sculpture of the more distal abdominal tergites, the triangular emarginate apex of the anal segment, the acuminate apices of the cerci, and the entire apical margin of the subgenital plate.

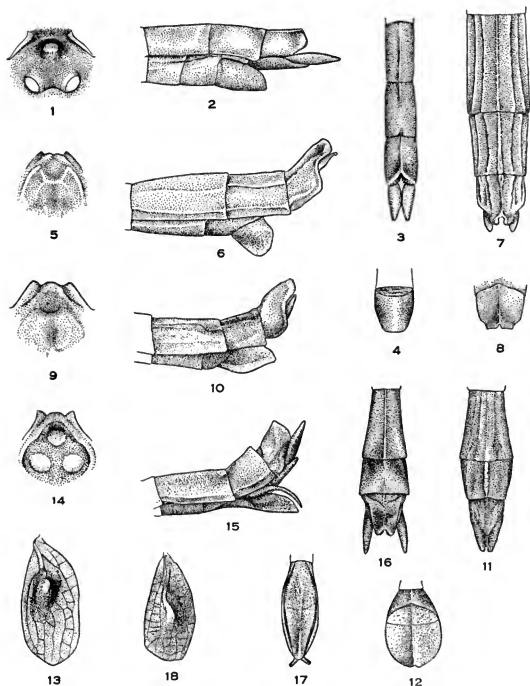
Type.—♂; Tefé, Amazonas, Brazil. December 16, 1919. (H. S. Parish.) [Academy of Natural Sciences of Philadelphia, Type No. 5736.]

Size medium; general form resembling that of the male sex of *I. ecuadoricus* Hebard, differing in the details of proportions given in the above comparative diagnosis; granulations of the mesonotum finer and less elevated than in *ecuadoricus*.

⁸ From *σαῦρος*, lizard, and *πτερόν*, wing, in allusion to the scale-like cross venation of the anterior field of the wing.

⁹ Trans. Amer. Entom. Soc., LIX, p. 37, (1933). [♂; Paramba, near Rio Mira, Imbabura, Ecuador.]

¹⁰ Archiv. für Naturg., n.f., IX, heft 4, p. 494, (1940). [♂; Rio Tacana, Upper Amazon.]



Isagoras sauropterus new species. Male (type). Tefé, Amazonas, Brazil. Fig. 1.—Ocellar area, as seen from dorsum (greatly enlarged). Fig. 2.—Lateral view of apex of abdomen (much enlarged). Fig. 3.—Dorsal view of same area as fig. 2 (same scale). Fig. 4.—Ventral view of subgenital plate (same scale).

Isagoras venezuelae new species. Male (type). Naiguatá, D. F., Venezuela. Fig. 5.—Ocellar area, as seen from dorsum (greatly enlarged). Fig. 6.—Lateral view of apex of abdomen (much enlarged). Fig. 7.—Dorsal view of same area as fig. 6 (same scale). Fig. 8.—Ventral view of subgenital plate (same scale).

Isagoras bishopi new species. Male (type). Río Garache, El Volcán, Chiriquí, Panama. Fig. 9.—Ocellar area, as seen from dorsum (greatly enlarged). Fig. 10.—Lateral view of apex of abdomen (much enlarged). Fig. 11.—Dorsal view of same area as fig. 10 (same scale). Fig. 12.—Ventral view of subgenital plate (same scale). Fig. 13.—Dorsal view of left tegmen ($\times 4$).

Isagoras metricus new species. Male (type). Tefé, Amazonas, Brazil. Fig. 14.—Ocellar area, as seen from dorsum (greatly enlarged). Fig. 15.—Lateral view of apex of abdomen (much enlarged). Fig. 16.—Dorsal view of same area as fig. 15 (same scale). Fig. 17.—Ventral view of subgenital plate (same scale). Fig. 18.—Dorsal view of left tegmen ($\times 4$).

Head with breadth across occipital base equal to five-ninths the median length of the head,¹¹ the genal outlines as seen from the dorsum very weakly converging caudad; ocelli placed in a narrow triangle, each relatively large and but little elevated, the caudal pair separated by an interval subequal to the diameter of a single ocellus,¹² the cephalic one flexed so that it faces dorso-cephalad and is well sunken in a distinctive pit-like fossa; surface of occiput and genae with a very few weak granules. Eyes moderately large and prominent. Antennae in an incomplete condition reaching almost to the apex of the abdomen, their general structure as in related species.

Pronotum slightly shorter and proportionately broader than in *I. ecuadoricus*, its greatest median length approximately 1.5 times its cephalic breadth (in *ecuadoricus* almost twice), transverse median impression distinct, surface granules almost entirely limited to four pair placed mesad on the central third of the surface. Mesonotum three times the length of the pronotum, of approximately subequal breadth, its surface subrugulose with a number of relatively low granulose points, which are smaller, lower and more rounded than those of *I. ecuadoricus*.

Tegmina about 1.12 times the length of the mesonotum, in shape much as in *I. ecuadoricus*, node relatively low and much rounded, less emphasized than in *ecuadoricus*; marginal field distinctly broader than in *ecuadoricus*, its breadth contained 6.5 times in the tegminal length (in *ecuadoricus* 11.6 times); venation of dorsal aspect of tegmina more open and regular than in *ecuadoricus*. Wings subequal in length to three-fifths that of the body.

Abdomen with its four distal tergites definitely carinate medio-longitudinally; anal segment with the outline of each of the two subvertical sections of its distal margin as seen in profile moderately arcuate, obtuse-angularly passing into a distal oblique section of the lateral (here ventral) margins of the segment, the remainder (more proximal portion) of these margins sublongitudinally truncate;¹³ cerci straight, subparallel, regularly acuminate in distal half with apices acute, their length distad of the anal segment being but little short of the length of the latter; subgenital plate simple, without lateral arms, relatively short and subequal in length to anal segment, distal margin arcuate, ventral surface without a medio-longitudinal carina.

Cephalic femora subequal in length to that of the head, pronotum and mesonotum combined, but as the mesonotum is definitely shorter than in *ecuadoricus* the cephalic femora are actually shorter in *sauropterus*, cephalic flexure occupying nearly the proximal half of the femur, distinctly more than is so involved in *ecuadoricus*. Median femora equal to three-fifths the length of the cephalic pair; median tibiae equal to six-sevenths the length of the femora. Caudal femora equal to four-fifths the length of the cephalic femora, extended caudad reaching to the middle of the third abdominal tergite; caudal tibiae but faintly shorter than the femora; caudal

¹¹ Both eyes have had their surfaces indented and in consequence the breadth across the eyes cannot be measured accurately.

¹² In *ecuadoricus* the ocelli are smaller, subacutely tuberculiform and elevated, and proportionately more widely separated.

¹³ In *ecuadoricus* the lateral margins of the anal segment are strongly concave-emarginate distad.

tarsi but faintly more than half as long as the caudal tibiae, instead of being equal to two-thirds the length of the same as in *ecuadoricus*.

Coloration.—General body color, including tegmina and anterior field of wings, tawny to russet, darkening proximad on the dorsum of the abdomen to cinnamon-brown, the apex of the abdomen blotched or clouded with the latter or prout's brown, the tegmina and anterior field of wings with numerous short pale cross-veinlets of ochraceous-buff, these producing an obscurely reticulate pattern. Antennae cinnamon-buff proximad, passing to deep malachite green distad, non-annulate. Mesonotum with a limited number of the granules touched with fuscous. Radiate field of wing washed with weak vinaceous-cinnamon, venation pencilled with snuff brown. Median limbs fluorite green; cephalic pair cinnamon-buff with a greenish wash in the genicular region; caudal pair buffy proximad passing to dull green distad.

Measurements.—Length of body, 55 mm; length of pronotum, 2.1; length of mesonotum, 6.5; length of tegmen, 7.3; length of wing, 35; length of cephalic femur, 11; length of median femur, 7.1; length of caudal femur, 8.9.

The type is unique.

Isagoras venezuelae new species

Figs. 5-8.

This species is closely related to *I. apolinari* Hebard,¹⁴ from Colombia. When compared with the type of that species *venezuelae* is seen to have the same general thoracic and alar form and proportions, as well as essentially the same coloration, but is larger, with a different structure of the anal segment of the male, this being similarly compressed rostrate, its apex, however, deeply fissate, and not transversely truncate as in *apolinari*, the encompassing lateral sections more attenuate and narrower than the profile view of the same area of *apolinari* shows for the disto-lateral portions of the segment. In addition all the more distal tergites of the abdomen are more elongate proportionately than in *apolinari*, and the ocelli are subobsolete. Günther's *I. tacanae*¹⁵ may be a near relative, but it is larger, and has different body proportions, viz., longer tegmina and cephalic femora, and certain genitalic differences, such as the arcuate lateral sections of the margin of the male subgenital plate.

Type.—♂; Naiguatá,¹⁶ Distrito Federal, Venezuela. Elevation 2400 feet. July 23, 1939. (G. V. Berthier.) [Academy of Natural Sciences of Philadelphia, Type no. 5739.]

¹⁴ Trans. Amer. Entom. Soc., LIX, pp. 36, 37, pl. II, figs. 10 and 11. [♂; Muzo, Boyaca, Colombia.]

¹⁵ Archiv für Naturg. n. f., IX, heft 4, p. 494. [♂; Rio Tacana, Upper Amazon.]

¹⁶ The town of this name is situated on the Caribbean coast approximately fourteen miles east of La Guaira, near the mouth of the Rio Naiguatá, which rises high in the coastal Andes. The elevation given is that of a station above the town, apparently on the Rio Naiguatá.

Size relatively large for the genus, appreciably surpassing that of *I. apolinari*; general form and body proportions much as in that species.

Head proportions as in *apolinari*, with breadth across occipital base to head length as 5 to 8.5, greatest breadth across eyes as 7.5 to the same ratios, genal outlines as seen from dorsum straight and subparallel; ocelli not clearly evident;¹⁷ surface of occiput and dorsal section of genae with a few sublongitudinal rugulae and scattered granules, as in *apolinari*. Eyes moderately large and prominent. Antennae when extended caudad reaching to the apices of the wings.

Pronotum with sculpture as in *apolinari*, its length somewhat greater, the greatest median length approximately 1.6 times the cephalic breadth. Mesonotum almost four times as long as the pronotum, its breadth approximately one-seventh of its length and in general subequal, its surface with a mesh of closely placed and short sublinear rugae, these in general trend sublongitudinal and becoming longer individually and more seriate caudad, a few inconspicuous tubercles scattered over them, but these less evident than on the less definitely rugose mesonotum of *apolinari*.

Tegmina subequal to half the length of the mesonotum, in general shape suggesting those of *apolinari* but with the outline less elliptical, shorter and broader; node full and rounded, moderately overhanging laterad; marginal field as in *apolinari*, relatively narrow, its breadth contained eight times in the tegminal length. Wings in length subequal to three-fifths that of the body.

Abdomen having the more distal tergites and anal segment with a relatively thick medio-longitudinal carinate ridge, which for much of its length is narrowly and shallowly sulcate mesad, more lateral surfaces of same tergites and anal segment with several marked sublongitudinal and roughly subparallel rugae; four distal tergites (including anal segment) very appreciably more elongate than in *I. apolinari*; anal segment with its medio-dorsal portion projecting caudad in a gable-like fashion, seen in profile the distal outline is markedly obtuse-angulate emarginate ventrad, this passing by an obtuse angle into the straight ventral margin of the more proximal section of the segment, dorso-mesad the distal margin is subfissately divided and the bounding lips of the overhanging portion are labiately thickened, and with their opposite internal faces supplied with numerous small incurved denticles; cerci subconical, somewhat deplanate ventrad in distal half, their apices very faintly surpassing the distal margin of the anal segment; subgenital plate lacking lateral arms, relatively short, not surpassing the distal margin of the penultimate tergite, in cross-section V-shaped, its ventral surface strongly carinate medio-longitudinally, its free margin roughly arcuate from lateral bases to a narrow median fission.

Cephalic femora subequal in length to the mesonotum, with the cephalic flexure of the same weak emphasis as in *I. apolinari*, in profile faintly deeper than in the latter species. Median femora equal to nine-tenths the length of the cephalic pair, form and carination as in *apolinari* but faintly more robust distad; median tibiae equal to seven-ninths the femoral length.

¹⁷ In *apolinari* the ocelli are small, yet clearly indicated, with the caudal pair moderately elevated and the cephalic one directed cephalad in the usual pit. In *venezuelae* in the same areas there are no surface differentiations which can definitely be called ocelli.

Caudal femora slightly exceeding the cephalic ones in length (approximately by one-eleventh of the length of the latter), extended caudad reaching nearly to the apex of the fourth abdominal tergite; caudal tibiae very faintly shorter than the femora; caudal tarsi lacking in type, in one paratype in which one is present the length is equal to one-third that of the tibia, thus appreciably shorter and also somewhat stouter than in *apolinari*.

Coloration.—General body tone buckthorn brown to clay color, overlaid to an individually variable degree with mummy brown, in one extreme (the type) the latter rather solidly suffusing the dorsal surface of the head, pronotum and mesonotum, and also virtually all of the cephalic and median femora except the distal eighth, and almost solidly darkening the dorsal surface of the distal portion of the abdomen. On other portions of the body and the limbs the dark tone is stippled or lined on carinae or present as minute ocelliform rings encircling mesonotal tubercles. Antennae pale with narrow dark annuli at the articulations, these becoming obsolete distad, proximal and second article pale ventrad, each with a dark spot, dorsal surface with (type and one paratype) or without dark suffusion. Tegmina cinnamon-buff to vinaceous-tawny, heavily infumate with mummy brown medio-longitudinally, particularly about node, palest along costal and internal margins; wings with anterior field marbled with walnut brown to vinaceous-russet on a pale base color of pinkish buff to cartridge buff; radiate field of wings faintly washed with pinkish brown, veins pencilled with fawn color.

Measurements of type.—Length of body, 62 mm; length of pronotum, 2.9; length of mesonotum, 11.8; length of tegmen, 5.8; length of wing, 36.6; length of cephalic femur, 12.5; length of median femur, 10.2; length of caudal femur, 14.6.

Paratypes.—In addition to the type I have before me two paratypic males bearing the same data as the type. These specimens differ from the type only in being slightly smaller, and in the range of color tone given in the above description.

Isagoras bishopi¹⁸ new species

Figs. 9-13.

More nearly related to *I. apolinari* Hebard,¹⁹ from the Eastern Cordillera of Colombia, with the type of which *bishopi* has been compared, than to any other described species. The present species agrees with *apolinari* in general proportions, the reduced ocelli and character of the male genitalia, but differs in the shorter mesonotum, the larger number of more pronounced tubercles laterad on the same (4 or 5 instead of 1 or 2), proportionately somewhat longer pronotum, more strongly developed and more elevated nodes on the tegmina, more subacute and less broadly rounded apices of the tegmina, the more produced and attenuate anal segment of the male, which in profile is more narrowly rounded distad and not at all abruptly

¹⁸ In honor of the collector of the type Dr. D. W. Bishop.

¹⁹ Trans. Amer. Entom. Soc., LIX. pp. 36, 37, pl. II, figs. 10 and 11, (1933). [♂; Muzo, Boyaca, Colombia.]

truncate as in *apolinari*, and in the more mottled and less uniform coloration of the tegmina and wings. From Günther's *I. tacanae*²⁰ this species can be distinguished by a number of features, the most evident of which are the over all much smaller size and far shorter tegmina.

There is also a close relationship to *I. venezuelae*, here described, but the shorter legs, the shorter mesonotum and its more decidedly spiniform tubercles, longer tegmina and more produced male subgenital plate are features which serve to distinguish *bishopi* from *venezuelae*.

Clearly *apolinari*, *venezuelae* and *bishopi* belong to a restricted group of species which are closely related, and inhabit mountain areas in north-western South America and adjacent Panama. Their general proportions, ocellar and tegminal development and basic male genitalic features are quite similar, as well as their clouded color patterns.

Type.—♂; Rio Garache, El Volcán, Province of Chiriquí, Panama. Elevation, 4100 feet. July 16 to 29, 1937. (D. W. Bishop.) [Academy of Natural Sciences of Philadelphia, Type no. 5740.]

Size distinctly smaller than in *I. venezuelae* (length of body, 52.5 mm.); general form similar to that of *venezuelae*.

Head with breadth across occipital base to median length of head as 5 to 8.5, the breadth across eyes being as 7, the genal outlines as seen from dorsum subparallel, weakly sinuate; ocelli as inconspicuous and little evident as in *venezuelae*, the general interocular area where they are situated weakly domed both transversely and longitudinally, the surface of this area not granulose, while the occipital and postocular genal surfaces have a number of sublongitudinally disposed granulations. Eyes as in *venezuelae*. Antennae falling slightly short of apex of abdomen, distad the articles individually are appreciably longer than in *I. venezuelae*, and subequal to those of *apolinari*.

Pronotum in proportions more as in *venezuelae* than in *apolinari*, the median length being 1.75 times the cephalic breadth, as against 1.6 in *venezuelae* and 1.26 in *apolinari*, general form as in former of these two, surface sculpture slightly more tuberculate than in either of the previously known species. Mesonotum but slightly more than three times as long as the pronotum, its average subequal breadth contained approximately 6.3 times in its length, its surface with a shallowly impressed medio-longitudinal sulcation and a generally rugulose sculpture, scattered over which are ten or so appreciable tubercles, roughly arranged by pairs in two subparallel series, the second and fourth pairs from the cephalic margin being larger and more pronounced than the others, all rounded, the smaller ones much less evident.²¹

Tegmina in length equal to eight-elevenths of mesonotal length, the general shape in its greater elongation and more elongate elliptical outline much nearer that seen in *apolinari* than that of *venezuelae*, the distal margin more

²⁰ Archiv für Naturg., n.f., IX, heft 4, p. 494. [♂; Rio Tacana, Upper Amazon.]

²¹ Similar tubercle series are intimated but far less evident in both *apolinari* and *venezuelae*.

narrowly rounded than in either of the compared species; node quite conspicuously elevated but well rounded and little projecting laterad, in the latter respect less marked than in *venezuelae*, which otherwise the node development of *bishopi* more nearly resembles; marginal field much as in *venezuelae*, somewhat more attenuate distad than in *apolinari*. Wings when closed reaching to the base of the antepenultimate tergite, longer proportionately than in *venezuelae* and subequal to those of *apolinari*.

Abdomen with the three terminal tergites more elongate than in *apolinari*, of similar proportions to those of *venezuelae*, these more sharply and narrowly carinate medio-longitudinally than in either *apolinari* or *venezuelae*, this carina not broad and definitely medio-sulcate as in the latter species, more lateral surfaces of penultimate and antepenultimate tergites longitudinally rugose as in the relatives; anal segment with median length subequal to that of penultimate tergite, its medio-dorsal rostrate portion more produced than in *apolinari* or *venezuelae*, its lateral margins similarly concave about cercal bases, the profile outline of its extremity well rounded, as in *venezuelae*, distal margin of rostrate production as seen from dorsum bilabially divided as in *venezuelae*, as usual in genus these labiations internally with recurved denticles; cerci not projecting distad of the anal segment, subconical as in *venezuelae*, deplanate ventro-mesad in distal half; subgenital plate lacking lateral arms, relatively short, but faintly surpassing distal margin of penultimate tergite, ventral surface markedly carinate medio-longitudinally, distal margin of plate well arcuate as seen from venter.

Cephalic femora slightly more than 1.2 times as long as mesonotum, cephalic flexure slightly more pronounced than in *apolinari*, somewhat less so than in *venezuelae*, in profile faintly shallower than in the former. Median femora equal to eight-ninths the length of the cephalic femora and subequal to length of mesonotum, general form as in *apolinari*; median tibiae equal to six-sevenths the length of the femora. Caudal femora equal to 1.1 times the length of the cephalic femora and 1.3 times that of mesonotum, extended caudad reaching nearly to the middle of the fifth abdominal tergite; caudal tibiae subequal to the femora in length; caudal tarsi definitely less than half as long as tibiae and thus somewhat shorter than in *apolinari*.

Coloration.—Base color pale glaucous-green, the whole heavily washed or overcast with bister to mummy brown, the suffusion in some areas sufficiently heavy to entirely obscure the pale base color, while in others the latter is evident as a pale mottling. Head, thoracic segments, tegmina, abdomen and greater portion of limbs largely mummy brown, the pale mottlings on the mesonotum small and minor in emphasis, the larger tubercles there solidly but narrowly ringed with blackish fuscous, tegmina with fuscous clouding chiefly evident as washes on the node and two areas along the sutural margin. Antennae as a whole dark, some of the more proximal articles paler proximad. Wings with anterior field mottled with bister, the pale base color more evident here than elsewhere, scattered blotches as dark as mummy brown, radiate field lightly washed with very pale smoke brown, venation not conspicuously lined.

Measurements of type.—Length of body, 52.5 mm.; length of pronotum, 2.6; length of mesonotum, 8.1; length of tegmen, 5.8; length of wing, 44; length of cephalic femur, 10.1; length of median femur, 8.9; length of caudal femur, 12.3.

The type of this rather striking species is unique.

*Isagoras metricus*²² new species

Figs. 14-18.

The character of the male genitalia, i.e., the possession of lateral arms partly encompassing the subgenital plate, aligns this species in the neighborhood of *I. affinis* Chopard²³ and *I. chopardi* Hebard,²⁴ of both of which type material is before me. In size *metricus*, of which the male sex alone is known, is larger than the same sex of either of these previously described species, and unlike them its subgenital plate is carinate and the lateral arms of the genitalia are more slender and attenuate. Its ocelli are also much larger than in the compared species and the mesonotum is proportionately more attenuate. Its relationship is closer to *chopardi* than to *affinis*, the tegmina being quite similar in form and venation, and less similar to what is found in *affinis*, and the same is true of the general sculpture and color pattern. From *chopardi* the new species also differs in the somewhat stouter limbs, although they are proportionately no longer, the cerci are slightly longer, but shorter than in *affinis*, and the lateral arms of the genitalia are not at all lamellate or spatulate, and are more regularly decurving distad. There is no close relationship to Günther's *I. tacanae*, referred to elsewhere in this paper.

Type.—♂; Tefé, Amazonas, Brazil. December 7, 1919. (H. S. Parish.) [Academy of Natural Sciences of Philadelphia, Type no. 5737.]

Size subequal to that of *I. venezuelae*, larger than the same sex of either *I. affinis* or *chopardi*; general form with a marked resemblance to that of *chopardi*.

Head with general proportions much as in the compared species, the breadth across occipital base to median length of head being as 5 to 8.5, the breadth across eyes as 7.6, the genal outlines as seen from dorsum faintly and subarcuately converging caudad of eyes; ocelli conspicuous elevated subcircular bosses arranged in a nearly equilateral triangle, the cephalic one bordered cephalad by an appreciable transverse pit, the whole area occupied by the ocelli moderately inflated; occipital and genal surfaces with a moderate number of linearly arranged (6 series) low but distinct rounded tubercles. Eyes quite prominent, in basal outline broad ovate, their length slightly shorter than that of postocular genae. Antennae damaged.

Pronotum with proportions as in *chopardi*, i.e., length 7 to 8.5 in head length, and cephalic pronotal breadth as 5; margins and major sculpture as in *chopardi*, surface with a number of sublinearly arranged low rounded tubercles, in character similar to those on head. Mesonotum 3.35 times as long as pronotum, its average, roughly subequal, breadth contained approximately 6.3 times in its length, as against approximately 5.1 in both *chopardi* and *affinis*, its surface with a deep but narrow medio-longitudinal sulcation,

²² In allusion to the caliper-like lateral arms of the male genitalia.

²³ Ann. Soc. Entom. France, 1911, p. 341, (1911). [♂, ♀; St. Jean du Maroni, French Guiana.]

²⁴ Trans. Amer. Entom. Soc., LIX, pp. 36, 37, pl. II, fig. 13, (1933). [♂, ♀ St. Laurent du Maroni, French Guiana.]

which is flanked by subsinuate bounding carinae, the more lateral sections of the mesonotal surface sublinearly rugose, the paired carinae and the more lateral rugae, as well as the mesosternal lateral margins, with numerous rounded tubercles, similar in type to but averaging larger than those of the head and pronotum. Mesosternal surface rather thickly covered with low irregular mesosternal rugulae, which are often subtuberculiform.

Tegmina quite similar to those of *I. chopardi*, the node development and venation being much the same, the former slightly more elevated and more strongly cariniform longitudinally, the latter with its transverse elements fewer and more regular in disposition, both features differing from the lower node and less longitudinal disposition of the principal veins seen in *I. affinis*; distal margin more broadly arcuate than in *chopardi*; marginal field as in *chopardi*. Wings when closed reaching to the middle of the sixth abdominal tergite.

Abdomen with the three terminal tergites each slightly longer than in *I. chopardi*, but with general form and development very similar;²⁵ medio-longitudinal carination of these, and of most of the preceding tergite, finely but sharply indicated; anal segment with distal two-thirds strongly tectate in cross-section, distal margin as seen from dorsum but shallowly and very broadly obtuse-angulate emarginate, in profile the rostrate portion of the disto-lateral margins is low arcuate, evenly passing ventrad into the pronounced juxta-cercal concavity of the same margins, adjacent to which the surface of the segment is marginally and glabrously thickened, internal faces of the labiately tectate extremity of the anal segment well supplied with incurved denticles; cerci with nearly half their length surpassing the margin of the anal segment, acuminate tapering to the rather blunt-acute apex as seen from dorsum, and moderately deplanate as seen in profile; subgenital plate supplied with lateral arms, which reach distad as far as the apex of the plate, and are slender, arcuately decurving, apically rounded structures, main portion of subgenital plate reaching distad as far as distal third of anal segment, its free margin elliptically rounded, narrowing distad, its ventral surface subcarinate medio-longitudinally, with the general texture rugulose.

Cephalic femora but slightly less than 1.25 times the length of the mesonotum, cephalic flexure well marked, in profile much as in *chopardi*. Median femora equal to seven-tenths the length of the cephalic femora and nearly nine-tenths that of the mesonotum, not quite as slender as in *chopardi*; median tibiae equal to slightly more than four-fifths the length of the median femora. Caudal femora slightly shorter than the cephalic femora, somewhat stouter than in *chopardi*, and slightly more than 1.1 times the length of the mesonotum, extended caudad reaching to the distal fourth of the third abdominal tergite; caudal tibiae definitely shorter than the femora, equal to but four-fifths the length of the latter; caudal tarsi equal to three-fifths the length of the tibiae, slightly less attenuate than in *chopardi* but otherwise quite similar.

Coloration.—General tone snuff brown, apex of abdomen, and to a lesser degree head, pronotum and mesonotum, washed with bistre; cephalic and

²⁵ This area in the type of *chopardi* has been subject to extraneous pressure and is in consequence measurably distorted, hence its cross-section must be reconstructed.

median limbs, tegmina and anterior field of wings clouded with or areally paling to glass green to light fluorite green, this strongest and more blotched in character on the tegmina, softer and more variegated as cloudings on the anterior field of the wings and more as a base tone on the cephalic and median tibiae, with the tarsi of the same limbs darkening in large part to cress green. Ocelli colonial buff, the area between them solidly bister; eyes mottled bister and fuscous. Radiate field of wing lightly infumate with smoke brown, main longitudinal veins pencilled with snuff brown. Subgenital plate finely vermiculate with pale green.

Length of body, 59.3 mm; length of pronotum, 2.6; length of mesonotum, 8.9; length of tegmen, 4.9; length of cephalic femur, 11; length of median femur, 7.8; length of caudal femur, 10.1.

The type of this species is unique.

*Isagoras subaquilus*²⁶ new species

Figs. 19-23.

Apparently more nearly related to *I. vignieri* (Redtenbacher),²⁷ from Darien, Panama, and *I. dentipes* of the same author,²⁸ from Chiriquí, Panama, than to any other known species. From *vignieri* the present species differs chiefly in its smaller size, in the presence of a pair of low spiniform tubercles close to the antennal bases, the sparser but still quite evident tubercles on the mesonotum, which, however, are not arranged in three paired series, in the different color pattern of the tegmina and wings, in the shorter limbs, in the non-lobate condition of the ventral margin of the cephalic femora, as well as of all margins of the median femora and of all the tibiae, and in the non-emarginate character of the distal margin of the subgenital plate. From *I. dentipes*, while of the same general size, the new species can be distinguished chiefly by its slightly shorter mesonotum, distinctly longer tegmina and femora, by the caudal femora being trilobate, instead of bilobate, dorsad, and by certain color features, such as the lack of the large sulphurous macula caudad on the metasternum, which is particularly mentioned in the description of *dentipes*.

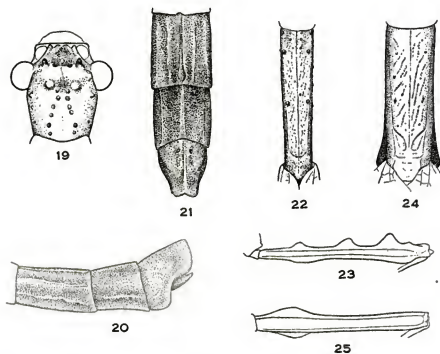
Type.—♂; Finca de los Cusingos, near San Isidro de General, Costa Rica.²⁹ May 3, 1944. (F. Schrader.) [Academy of Natural Sciences of Philadelphia, Type no. 5738.]

²⁶ In allusion to the general tone of the insect.

²⁷ *X[erosoma] vignieri* Redtenbacher, in Brunner and Redtenbacher, *Insektenf. Phasm.*, I, pp. 143, 144, (1906). [♂; Paya, Darien, Panama.] The correct generic position of this species was pointed out by Hebard in 1923 (*Trans. Amer. Entom. Soc.*, XLVIII, p. 351).

²⁸ *Isagoras dentipes* Redtenbacher, in Brunner and Redtenbacher, *Insektenf. Phasm.*, I, pp. 133, 134, (1906). [♂; Bugaba, Chiriquí, Panama.]

²⁹ This locality is in the southern part of the Province of San José, on the Pacific slope of the Cordillera de Talamanca, on the Río Peña Blanca, an upper tributary of the Río General, which flows into the Río Diquis. The elevation is approximately 2600 feet, and the approximate position of the locality is 9° 25' N., 83° 44' W. The conditions, according to Dr. Sally Hughes-Schrader, are those of undisturbed western Costa Rican rain forest.



Isagoras subaquilus new species. Male (type). Finca de los Cusingos, near San Isidro de General, Costa Rica. Fig. 19.—Dorsal view of head ($\times 8$). Fig. 20.—Lateral view of apex of abdomen (much enlarged). Fig. 21.—Dorsal view of same area as fig. 20 (same scale). Fig. 22.—Dorsal view of pronotum ($\times 4$). Fig. 23.—Outline of caudal femur ($\times 4$).

Isagoras schraderi new species. Female (type). Barro Colorado, Canal Zone, Panama. Fig. 24.—Dorsal view of pronotum ($\times 4$). Fig. 25.—Outline of caudal femur ($\times 4$).

Size medium (for genus); form moderately slender.

Head rather short, with greater breadth across occiput equal to five-eighths the median length of the head, the latter subequal to the greatest width across eyes, lateral (genal) margins, as seen from dorsum, slightly converging caudad; a pair of low spiniform tubercles, with rounded apices, is placed near and immediately caudad of the dorsal margin of the antennal scrobes, these directed dorso-cephalad and separated by a distance equal to one-fourth of the evident length of the head; ocelli distinct, the caudal pair rather large low rounded bosses, the cephalic on much smaller, placed between the pair tubercles, more conspicuously indicated than the larger caudal pair, and situated on the cephalic slope of a broad rounded transverse surface swelling, at the caudal base of which the caudal pair of ocelli is placed, cephalic one bordered cephalad by a moderately deep, subtransverse surface depression; surface of occiput with scattered tubercles of varying size, of which a pair of cephalad-converging linear series are the sole ones of such disposition. Eyes of the prominence usual in the genus, subglobose. Antennae subequal to the body in length, articles beyond second relatively elongate, rather markedly setose.

Pronotum in length slightly shorter than head (as 7 to 8), its cephalic breadth equal to five-sevenths of its length and this margin distinctly concave, caudal margin somewhat narrower than cephalic, subtruncate, lateral margins markedly arcuate emarginate in cephalic half above the cephalic portion of the sockets of the cephalic limbs; surface of pronotum with a medio-longitudinal pair of linear series of four rounded tubercles each, other tubercles little evident, transverse impression median and arcuate, pronotum briefly bordered laterad by subcarinate folds which join the lateral margins latero-cephalad. Mesonotum 3.1 times as long as pronotum, its breadth uniform and equal to two-thirds of pronotal length or one-fifth of its own length, its surface markedly rugulose, with a general longitudinal and definitely sinuate disposition of the rugulae, on which are placed a number of rounded tubercles of several sizes, most of the larger ones regularly paired, one group at the middle point of the length, another at cephalic sixth, several unpaired tubercles of larger size placed near the cephalic margin, which bears a series of four spaced tubercles of which the lateral ones are the larger, lateral borders with eight to nine spaced tubercles.

Tegmina slightly shorter than the mesonotum, elongate-ovate in general outline, subacute at apices; node subbulbosely inflated, weakly overhanging laterad, the lateral outline of the overhang, as seen from dorsum, unevenly arcuate, its surface somewhat sunken between the irregular nodal venation; areolation of remainder of tegminal surface as a whole generally subquadrate to subrectangulate, particularly in postnodal section; marginal field relatively narrow, median portion of its margin nearly straight. Wings, when closed, reaching to base of antepenultimate tergite, anterior field with its areolation very largely quadrate to subrectangulate, accessory longitudinal veins more sinuate than the short transverse ones.

Abdomen with length of anal segment subequal to that of preceding penultimate tergite, that of antepenultimate tergite approximately 1.75 times that of each of the succeeding ones, and but slightly less than their combined total; medio-longitudinal carina on anal segment and penultimate tergite sharp, on antepenultimate and preceding tergite less elevated and broader, on the former divided by a median rounded sulcus which expands distad, on the preceding tergite less evident proximad and mesad and briefly divided and sulcate distad, penultimate and antepenultimate tergites on each side with two supplementary spaced longitudinal carinae, which are much more weakly continued on the preceding tergite; anal segment appreciably compressed, with distal margin of rostrate section, as seen from dorsum, roughly transverse truncate, in profile the same area is vertically subtruncate dorsad, narrowly rounding to the broadly and strongly concave juxtaposed section of the ventro-lateral margin, which in its proximal two-fifths is moderately arcuate, more distal portion of the concave area alone labiately thickened, this internally, as well as the ventral surface of the "roof" of the segment, with distinct and rather regularly spaced recurved denticles; cerci not surpassing anal segment in length, roughly subconical, rather shrivelled in type; subgenital plate without lateral arms, in length not surpassing the distal margin of the penultimate tergite, its distal margin produced mesad in a brief, rather broadly rounded lobation, ventral surface of plate with a distinct and well-elevated medio-longitudinal carination, which

in the median portion of its length is accompanied by a pair of flanking accessory carinae, the profile outlines of which are arcuate.³⁰

Cephalic femora subequal in length to that of the head and pronotum combined, slender, subcompressed, cephalic flexure well marked and occupying proximal third, dorsal margins faintly undulate but not at all lobate, ventral margins entire; cephalic tibiae faintly longer than the femora, very slender, dorsal surface finely sulcate longitudinally, margins non-lobate. Median femora approximately two-thirds as long as cephalic ones, carinate margins non-lobate; median tibiae equal to eight-ninths of the femoral length, margins non-lobate. Caudal femora three-fourths as long as cephalic femora, extended caudad reaching nearly to the distal margin of the third abdominal tergite, in cross-section subtriquetrous, dorsal margins carinate and closely placed, intervening area narrowly sulcate, dorso-cephalic margin with three spaced trigonal lobes, the proximal smaller than the other two subequal ones, dorso-caudal margin with but slight rudiments of lobes opposite the proximal and median lobes of the paired margin, ventro-cephalic margin with a broad but quite low arcuate lobation distad and another of similar character briefly distad of base, ventro-caudal margin with a similar but weaker and lower lobation distad; caudal tibiae slightly shorter than the femora, margins carinate and non-lobate, dorsal surface sulcate; caudal tarsi two-thirds as long as caudal tibiae, proximal article slightly shorter than remaining articles combined, all articles compressed to a greater or lesser degree, dorsad in part at least sulcate medio-longitudinally.

Coloration.—Base color comprising tones of grayish green (yellowish glaucous to vetiver green of Ridgway's standards) with an over-pattern of olive to fuscous-black. Head with a transverse cloud infuscation between the antennae, tubercles fuscous, eyes fuscous mottled on pale, antennae with the first two proximal articles broadly barred longitudinally on cephalic face with fuscous, caudal surface clouded with same, remainder of antennae pale, very narrowly annulate with fuscous at the articulations. Pronotum and mesonotum relatively dull and grayish, not strongly mottled, larger paired tubercles on mesonotum touched with fuscous; pleura and sterna mottled and lichenose, greenish and fuscous, no yellow patch on mesosternum. Tegmina with nodes and adjacent sutural area washed with bister, more distal section with some fuscous blotches. Wings with anterior field nebulosely mottled with fuscous on a pale ground; radiate field pale smoke brown with venation somewhat darker in pencilling. Abdomen distad on both surfaces somewhat strigate with fuscous on a pale ground, the anal segment washed with fuscous. Limbs mottled or annulate, in varying degrees of completeness, with the two color elements.

Measurements.—Length of body, 53.5 mm.; length of pronotum, 2.4; length of mesonotum, 7.3; length of tegmen, 6.5; length of cephalic femur, 11.4; length of median femur, 7.3; length of caudal femur, 8.4.

In addition to the type I have before me a male individual in the instar preceding maturity, which was taken at the same place and time as the type.

³⁰ This plate is strongly and abnormally compressed in the type, and these accessory carinae may be much less evident in a less shrivelled individual.

*Isagoras schraderi*³¹ new species

Figs. 24-25.

This very unusual species of the genus is known only from the female sex, but on account of certain of its outstanding characteristics I feel warranted in describing it without knowing the male sex. It agrees with none of the species known to Redtenbacher in 1906, and of those described since, the types or paratypes of all except *I. tacanae* Günther are now before me. Of these latter species the female sex has been described only for *I. affinis* Chopard and *chopardi* Hebard from French Guiana, and a paratype female of the former, and the allotype of the latter are now in hand. The character of the caudal femora in *schraderi*, i.e., with a broad, low rounded proximal lobation on both the dorso- and ventro-cephalic margins, is shared by no other known species, while the very short limbs and mesonotum, which latter is subequal in length to the tegmina, are other unusual features. Comparison with previously known species is therefore unnecessary.

Type.—♀; Barro Colorado Island, Canal Zone, Republic of Panama. December 27, 1939. (F. Schrader.) [Academy of Natural Sciences of Philadelphia, Type no. 5741.]

Size medium (length of body, 62.5 mm.); limbs quite short for genus.

Head relatively short, breadth across occipital base equal to seven-tenths of median length of head, breadth across eyes but little less than length of head (as 9.3 to 10), genal outlines slightly arcuate divergent cephalad, rather broadly rounding into occipital base caudad; ocelli relatively small but clearly marked, placed in an equilateral triangle, the cephalic one bordered cephalad by a rather deep transverse narrow groove-like pit, caudal pair individually directed caudo-laterad, bordered caudad by a transverse broadly zig-zag impressed line, which becomes obsolete laterad; eyes very slightly flattened laterad as seen from dorsum, basal outline, as seen in profile, almost circular, depth to length being as 2.5 to 2.75, latter contained approximately twice in the postocular length of genae. Antennae incomplete.

Pronotum slightly shorter than head, its median length to that of latter as 8.5 to 10, its greatest caudal breadth to length as 7 to 10; cephalic margin as a whole moderately concave, caudal margin shallowly convex; surface with a slightly premedian transverse arcuate impression, a less definite, much finer and shallower medio-longitudinal sulcation, plus moderately cingulate lateral borders, and in cephalic half cephalad are also paired diverging juxta-marginal cariniform folds, which join the brief oblique concavely truncate latero-cephalic borders, immediately mesad of which latter the surface is substrumosely tumid, and rather sharply cut off from the smoother and more transversely arcuate median portion of the surface by sublongitudinal impressions. Mesonotum about 2.4 times as long as pronotum and equal in length to the tegmina, its median length equal to three times its caudal breadth, which is but faintly greater than that mesad, the

³¹ In recognition of the interest in these insects of Drs. Franz Schrader and Sally Hughes-Schrader, distinguished cytologists, who collected the type of this and other new species of Orthoptera in Costa Rica and Panama.

breadth being approximately subequal throughout and the lateral borders virtually straight; surface with a weakly impressed medio-longitudinal sulcation, which is not sharply or uniformly defined, remainder of surface moderately rugulose, the rugulae often sublinear with a general sublongitudinal trend, three or four paired low and relatively weak tubercles evident in a sublongitudinal disposition on each side rather nearer the lateral borders than the median sulcation; mesopleura and mesosternum similarly rugulose, but these rugulae show less sublinear or sublongitudinal tendencies.

Tegmina of same length as mesonotum, elliptical in outline, apex subtruncately rounded, costal margin moderately arcuate to near apex where the arcuation becomes more decided, sutural margin moderately arcuate; node distinct but relatively low, rounded longitudinally, little elevated and not overhanging laterad; venation moderately open. Wings reaching caudad as far as the distal margin of the sixth abdominal tergite; anterior field with its areolation fundamentally quadrate to transversely rectangulate in shape.

Abdomen with sixth tergite subarcuately expanded laterad in its distal half, the breadth there but little less than twice proximal breadth and virtually subequal to half the tergite's length, seventh tergite and succeeding ones relatively narrow, subcompressed, length of seventh slightly less than that of sixth, of eighth equal to two-thirds that of seventh, and of ninth to a similar proportion of eighth; anal segment very slightly shorter than ninth tergite, slightly ampliate distad as seen from dorsum, its distal margin in same view rather broadly arcuate, dorsal surface of anal segment in distal half rather broadly impressed exclusive of the distal margin and a medio-longitudinal keel-like ridge, in profile the outline of the distal and ventrolateral margins are subuniformly arcuate; cerci hardly exceeding the distal margin of the anal segment, styliiform, appreciably depressed, bluntly conical at apices; subgenital plate with distal margin moderately acute-angulate, its apex little surpassing the same margin of the eighth tergite.

Cephalic femora slightly shorter than combined length of pronotum and mesonotum, cephalic flexure pronounced and occupying practically all of the proximal half of the femur, femur mesad rather broad in depth, this equal to one-eighth of the femoral length, all carinae well emphasized but non-lobate; cephalic tibiae nearly seven-eighths as long as the femora, simple, non-lobate. Median femora in length equal to approximately two-thirds that of cephalic femora, moderately slender, simple, carinate but non-lobate; median tibiae slightly more than five-sixths as long as the femora, simple, carinate. Caudal femora slightly shorter than cephalic femora, subtriquetrous in cross-section, the paired dorsal carinae well marked with caudal one in proximal third developed into a long and low rounded lobe, ventral surface rather broad and deplanate with a slight medio-longitudinal carinula, the ventro-cephalic margin merely carinate, the ventro-caudal one appreciably lamellate in proximal third with a long and low rounded lobe further expansion, in the same relative position as that on the dorso-caudal margin; caudal tibiae five-sevenths as long as the femora, at distal extremity slightly thickened dorsad, otherwise simple, carinate; caudal tarsi four-fifths as long as tibiae, proximal article comprising two-fifths of tarsal length.

Coloration.—Base tone grayish olive to hair brown, areally washed with fuscous, no striking pattern features; anterior field of wings with the grayish olive base nebulously mottled with weak fuscous, numerous short sections of the main venation lined with fuscous, radiate field of wings very faintly infumate, radiate veins weakly pencilled with saccardo's umber; area about, and for a short distance distad of, the tegminal node washed with weak glass green. Eyes bister.

Measurements.—Length of body, 62.5 mm.; length of pronotum, 3.2; length of mesonotum, 7.8; length of tegmen, 7.8; length of wing, 42.7; length of cephalic femur, 9.6; length of median femur, 6.8; length of caudal femur, 8.3.

The type of this very distinctive species is unique.

SOME RECORDS AND DESCRIPTIONS OF DIPLOPODS CHIEFLY IN THE COLLECTION OF THE ACADEMY

BY RALPH V. CHAMBERLIN

This paper is based primarily upon a study of a portion of the milliped collection of the Academy of Natural Sciences of Philadelphia, made possible through the courtesy of Mr. J. A. G. Rehn, Curator of Insects of that institution. Of the forty new species here diagnosed, all are based upon this material with the exception of *Dixioria dentifer* and *Deltotaria nigri-montis*, the types of which belong to the American Museum of Natural History, and the two species of *Onychelus* which are based upon specimens at present in the writer's collection, but the types of which will be placed in the Academy series.

LYSIOPETALIDAE

Spirostrephon lactarium (Risso)

KENTUCKY: Pine Mt.; April 30, 1921; one female taken by W. Stone. MARYLAND: Harford County, The Rocks; Aug. 18, 1912; H. W. Fowler, coll. NORTH CAROLINA: Cranberry; 1886; one male collected by A. Heilprin. PENNSYLVANIA: Leshanning Falls; Sept. 6, 1915; one specimen taken by H. W. Fowler. Valley Forge; May 9, 1933; J. B. Clark coll. VIRGINIA: Arles County, Spruce Run Cave.

Spirostrephon creolum Chamberlin

MISSISSIPPI: Chariton County; two specimens taken by Chas. Veatch. A species previously known only from Louisiana.

POLYXENIDAE

Polyxenus fasciculatus Say

NEW YORK: Saratoga. No further data. Several specimens now in poor condition. NEW JERSEY: Above Burlington, at Delaware River; May 9, 1915.

STYLODESMIDAE

Styraxodesmus cubensis new species

Fig. 1.

Ground color fulvous but appearing dusky from adherent foreign particles.

Characterized by the very high combs of the two dorsal rows; also distinguished from previously known species in having these combs on segments II to XIX inclusive formed by the consolidation of three tubercles

in each. The combs on segment XIX much lower, forming smooth ridges that project widely over and beyond the last segment. The much lower lateral series also composed of three tubercles on each of the segments. Lower and less clearly defined tubercles also on each side of the principal lateral series and between the dorsal combs.

Collum with the typical ten marginal lobes, the incisions between these deep. Dorsal surface with two transverse series of large tubercles, an anterior row of 4, and a posterior row of 6.

Keels of second segment with three distinct lateral lobes. On the following three non-poriferous keels back to the eighteenth, the lateral lobes are two less closely indicated lobes, the poriferous keels with the indications of three keels of 19th segment with margin smooth and evenly convexly rounded. Anal tergite trilobed, the median lobe much larger than the lateral.

Basal segment of the gonopods proportionately very large and hemispherical, concealing the small blade of the telopodite, which lies against its mesal face, in lateral view. See further fig. 1. Length 6 mm.

Locality.—Cuba, Tapaste. Nov. 21, 1919. Cabrera, coll. One male, holotype. [Academy of Natural Sciences of Philadelphia, Type no. 9942.]

This species is somewhat larger than the two previously known species, both of which were found in Haiti.

POLYDESMIDAE

Polydesmus coriaceus Porat

Polydesmus coriaceus Porat, Öfvers. Vetensk. Akad. Förh., 1870, Nr. 7, p. 819, fig. 7.
Polydesmus testi Bollman, Proc. U. S. Nat. Mus., 1887, Vol. 10, p. 617.

MASSACHUSETTS: East Sandwich; Sept. 26, 1919; one male and three females. DELAWARE: Lewes; Apr. 25, 1913; H. W. Fowler, coll.

A common European species probably introduced into America, where it is now widespread in the eastern and midwestern states.

Pseudopolydesmus hubrichti Chamberlin

MISSOURI: Chadwick; one male taken in 1900 by H. A. Pilsbry. LOUISIANA: Morehouse Parish, near Miller Landing; one male taken in 1909 by C. B. Moore.

This species was previously known from Missouri and Oklahoma.

Pseudopolydesmus serratus (Say)

NEW JERSEY: Westmont; one male taken Oct. 1, 1916. Camden County, Delaware River; Mar. 27, 1915.

PENNSYLVANIA: Bristol; a female taken April 27, 1913 by W. Stone. Edgehill; April 16, 1893; several males and females taken by P. Nell. Perry County, Cove Mt.; Sept. 25, 1914; one female taken by W. Stone. Delaware County, Cobbs Cr.; Mar. 16, 1912; one taken by H. L. Mathis, Jr. McKean County, Port Alleghany; Aug. 1904; four specimens taken by T. D.

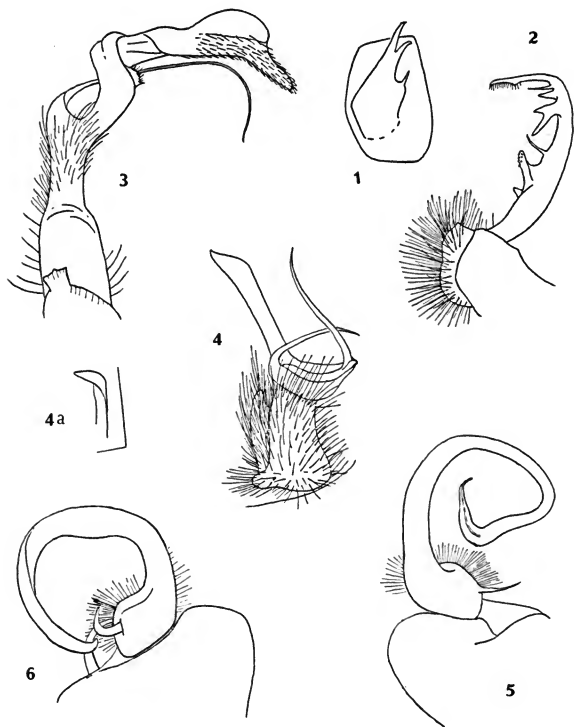


FIG. 1.—*Styrazodesmus cubensis* n. sp. Gonopod of male, mesal aspect. FIG. 2.—*Dizidesmus catskillus* n. sp. Left gonopod of male, ectal aspect. FIG. 3.—*Semionellus placidus* (Wood). Left gonopod of male, ectal view. FIG. 4.—*Motyzia tejona* n. sp. Left gonopod of male, subventral view. FIG. 4a.—The same. Tip of dorsal lamella of right gonopod of male, submesal view. FIG. 5.—*Apheloria coriacea* (Koch). Left gonopod of male, cephalic aspect. FIG. 6.—*Apheloria pinicola* n. sp. Right gonopod of male, anterior view.

Keim and H. W. Fowler. York Furnace, May, 1906; W. Stone and H. W. Fowler coll. Philadelphia, Holmesburg; June 25, 1910 and Mar. 23, 1913; H. W. Fowler, coll. Philadelphia, Fairmount Park; Mar. 25, 1911; two specimens taken by H. L. Mathis, Jr. MARYLAND: Harford County, Swan Creek; May 20, 1914; H. W. Fowler coll. Anne Arundel County, near Mayo; Mar. 29, 1916; H. W. Fowler, coll.

VIRGINIA: Giles County, Spruce Run Cave; several specimens.

NEW YORK: Ithaca; Apr. 27, 1936; several specimens taken by J. W. H. Rehn. Catskill; several males and females taken by Knight.

Dixidesmus catskillus new species

Fig. 2.

The type is a bleached specimen in which color is nearly obliterated, but the pattern shows the keels lighter in color than the mid-dorsum.

Keels relatively large and elevated, with margins showing three minute teeth or serratures. Tubercles of last two rows well defined, those in front of the transverse sulcus only obscurely defined.

This form is set apart from *tallulanus* and related species on the basis of differences presented in the gonopods of the male, in which the spine developments at the distal end of the telopodite are unlike those in any other known American species (Fig. 2).

Width, 4 mm.

Locality.—New York: Catskill. Male holotype collected by Knight. [Academy of Natural Sciences of Philadelphia, Type no. 9943.]

A female taken with the holotype and probably the same species is 4.4 mm. wide.

SPHAEROTRICHOPIDAE

Scytonotus granulatus (Say)

PENNSYLVANIA: Philadelphia, Holmesburg; Oct., 1913; two specimens taken by H. W. Fowler.

CHELODESMIDAE

Semionellus placidus (Wood)

Fig. 3.

MARYLAND: Garrett County; July, 1907; a male taken by W. Stone, T. D. Keim and H. W. Fowler.

The gonopods of this specimen agree fully with those of Wood's specimen. (See fig. 3.)

Harpaphe intaminata (Karsch)

Polydesmus (Oxyurus) intaminatus Karsch, Archiv. f. Naturg., 1881, vol. 47, p. 41.

Leptodesmus intaminatus Attems, Denbr. Kair. Akad. Wien, 1898, vol. 67, p. 387.

Harpaphe intaminata Cook, Harriman Alaska Exped., 1904, vol. 8, p. 60.

Paimokia scotia Chamberlin, Bull. Univ. of Utah, Biol. series, 1941, vol. 6, no. 5, p. 13.

CALIFORNIA: Santa Cruz; one male. California: A male and female collected by Dr. J. L. Leconte.

These specimens were in a vial with some of *Xystocheir dissecta* (Wood). The original label in the vial gives Georgia as the locality, an error noted in a number of other cases in connection with undoubtedly Californian specimens sent by Dr. Le Conte to the Academy.

Harpaphe haydeniana (Wood)

OREGON: Lane County, vicinity of Vida, elev. 3,000 ft.; June 28, 1941, several specimens. Eugene; June 27, 1941; one specimen.

XYSTODESMIDAE

Xystocheir dissecta (Wood)

Polydesmus dissectus Wood. Proc. Acad. Nat. Sci. Phila., 1867, p. 129.

Polydesmus (*Fontaria*) *furcifer*; Karsch; Archiv. f. Naturg., 1884, p. 39.

Xystocheir obtusa Cook, Harriman Alaska Exped., 1904, vol. 8, p. 53, pl. 4, figs. 1a-1c.

CALIFORNIA: Several males labeled "Georgia, Dr. J. LeConte", but the locality is undoubtedly an error such as occurred with other species collected by Dr. Le Conte. These were probably specimens studied by Dr. Wood and may be cotypes. They agree fully with Cook's descriptions of *obtusa*.

Xystocheir taibona Chamberlin

CALIFORNIA: Los Gatos, Coast Mts. A male and female, erroneously labeled "*Polydesmus haydenianus* Wood".

Motyxia tejona new species

Fig. 4 and 4a.

The types, after long preservation, vary from brown with yellow keels to yellow of a slight orange cast.

It is a smaller form than the two species previously known and is distinct from *M. kerna*, the generotype, in the details of the gonopods of the male. In the telopodite of these the dorsal lamellar branch is different in the form of its distal end and in the longer and decidedly more curved slender mesal branch, etc., as shown in figure 4.

Agreeing in general form of the keels with *M. kerna*.

Length of male holotype 24 mm.; width, 5 mm.

Locality.—California: Ft. Tejon. One male (holotype) and two females. [Academy of Natural Sciences of Philadelphia, Type no. 9944.]

In addition to *M. kerna* and *M. tejona*, a species, *M. pior*, is known from Tulare Co. This third species is distinct, aside from its gonopods, in its nearly black color and its larger size, its width being 7 mm.

Apheloria coriacea (C. Koch)

Fig. 5.

Fontaria coriacea C. Koch, Syst. d. Myr., 1847, p. 141; Die Myr., 1863, p. 72, fig. 63.

Polydesmus (*Fontaria*) *corrugatus* Wood, Proc. Acad. Nat. Sci. Phila., 1864, p. 6; Trans. Am. Phil. Soc., 1865, vol. 13, p. 222.

MARYLAND: Garrett County; two males collected by H. W. Fowler, July, 1905; July, 1907; six specimens collected by W. Stone, T. D. Keim and H. W. Fowler. PENNSYLVANIA: Potter County, Gold; June 3, 1906; a male

and female; H. W. Fowler, coll.; also two specimens taken June 3, 1907 by T. D. Keim and H. W. Fowler. Harvey's Lake; five specimens in part of which the coloration is about what is described for *A. trimaculata* as which three specimens were labeled, the gonopods however, are typical for *coriacea*. (See fig. 5).

The features of the male gonopod of this species are shown in fig. 5.

Apheloria pinicola new species

Figs. 6 and 7.

A species close to *A. adela* of New York State, etc., in the form of the blade of the male gonopods. This narrows gradually distally whereas in *adela* it widens obviously before narrowing into the curved tip; the latter, also, is more evenly curved, not somewhat abruptly geniculate as in *adela*. (See figs. 6 and 7.) As in *adela*, the posterior coxae, are spined. Similarly, too, neither the anterior nor the posterior sternites are spined.

The type specimen appears to be considerably bleached. The dorsum shows the posterior portion of the keels and a narrow stripe across posterior border of the tergites as yellow, but on the anterior tergites the yellow stripe may be absent or replaced by dark ferruginous. The dorsum elsewhere is brown.

Length, about 40 mm.; width, 8 mm.

Locality.—Kentucky: Pine Mt. Two males and two females taken April 30, 1921 by Witmer Stone. [Holotype ♂, Academy of Natural Sciences of Philadelphia, Type no. 9945.]

Apheloria roanea new species

Fig. 8.

Dorsum black, each tergite trimaculate, the spot on keels large, the mid-dorsal one small and, at present lens bright. Legs yellow, thus differing from *A. montana* (Bollman), in which the legs are black.

A large, broad form in which the keels are large and their declivity moderate.

Posterior coxae and sternites spined.

The species seems distinct in the form of the apical portion of the telopodite of the male gonopods as well as in the form of the basal spine as illustrated (fig. 8).

Length of male holotype, 45 mm.; width, 12 mm.

Locality.—Tennessee: Roane County, Harriman. One male, holotype, taken June 3, 1895 by S. N. Rhoads. [Academy of Natural Sciences of Philadelphia, Type no. 9946.]

Brachoria brachypus new species

Fig. 9.

A species similar to *B. sequens* in showing two joints in the telopodite of the male gonopods, but differing in the obviously greater width of the organ and in its form as shown in the figure (fig. 9).

None of the coxae bear spines or conical processes and the sternites are also unarmed.

The type specimen is too much bleached to permit much inference as to original color. The dorsum appears to have been crossed by rather broad

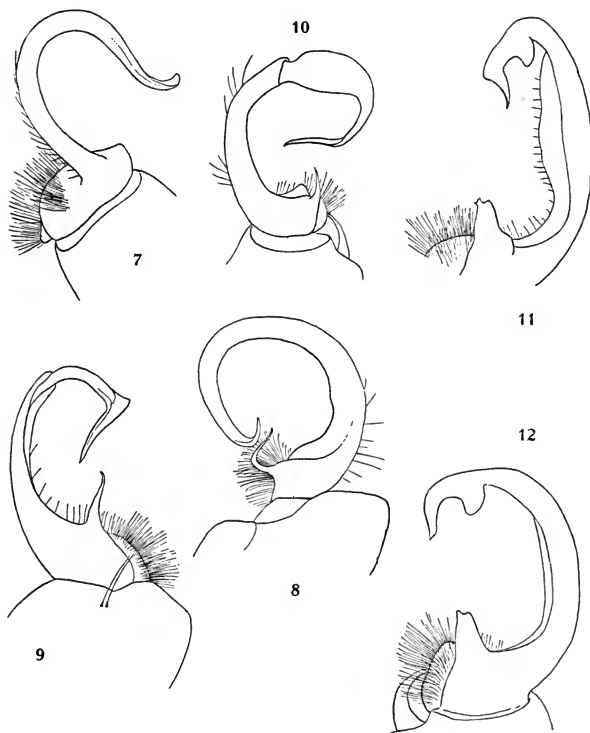


FIG. 7.—*Apheloria pinicola* n. sp. Left gonopod of male, subectal view. FIG. 8.—*Apheloria roanea* n. sp. FIG. 9.—*Brachoria brachypus* n. sp. Left gonopod of male, subventral view. FIG. 10.—*Brachoria separanda* n. sp. Left gonopod of male, cephalo-ventral view. FIG. 11.—*Deltotaria nigrimontis* n. sp. Right gonopod of male, submesal view. FIG. 12.—The same. Subcephalic view of same gonopod.

cross bands of yellow connecting the yellow areas of the keel. The brown color now showing elsewhere on the tergites may have been chestnut.

Width, 10 mm.

Locality.—Tennessee: Roane County, Harriman. One male, holotype, taken June 3, 1895 by S. N. Rhoads. [Academy of Natural Sciences of Philadelphia, Type no. 9947.]

***Brachoria separanda* new species**

Fig. 10.

The original color can not be given with any certainty, but the pattern shows paler, probably yellow, keels and cross bands of similar but more obscure color. The cross bands may not have been distinct in life.

The posterior coxae bear conical processes at the distal end.

The features of the gonopods are distinctive and are as shown in fig. 10.

Length, about 32 mm.; width, 6.5 mm.

Locality.—Maryland: Garrett County, Jennings. One male, holotype, collected by H. W. Fowler. [Academy of Natural Sciences of Philadelphia, Type no. 9948.]

Distinguished from the generotype *B. initialis* and other previously known species by its notably smaller body size and the form of the gonopods.

***Deltotaria nigrimontis* new species**

Figs. 11 and 12.

It is impossible to infer the original color of the much faded types, but they seem to have had the common pattern of yellow or other light color on keels and in a narrow band along the caudal margin of each tergite.

The gonopods are distinct in the details of structure, the process or peg from base of telopodite being much longer than is represented for *D. brimleyi*, with the terminal divisions of the blade also characteristically different as shown in the figures (figs. 11 and 12).

The posterior coxae are spined.

Width, 8 mm.

Locality.—North Carolina: Black Mountain. The male holotype and several other specimens, all broken. [American Museum of Natural History, Type no. 1603.]

DIXIORIA new genus

Gonopods of the male with the telopodite slender and curved into a circle as in *Apheloria*. It differs from *Apheloria* in having a tooth on the telopodite proximad of a slender tip and in the stouter basal spine. The blade is more slender than in *Deltotaria* and the basal development is in the form of a stout hook rather than an erect peg.

GENEROTYPE.—*Dixioria dentifer* new species.

***Dixioria dentifer* new species**

Fig. 13.

The original color is lost, but the keels appear to have been yellow or red and light cross bands are not indicated.

The coxae of some of the more posterior legs show conical processes but most of the legs do not bear them.

The features of the gonopods are shown in the illustration (fig. 13).

Width of the male, near 8 mm., of the female allotype, close to 9 mm.

Locality.—North Carolina: Cranberry. Male holotype, female allotype, and a not fully grown specimen taken by H. W. Wenzel in June, 1896. [American Museum of Natural History, Type no. 1328.]

***Epeloria leiacantha* Chamberlin**

ALABAMA: A much broken male agreeing with Georgia specimens in details of the gonopods; F. G. Schaupp, coll.

***Nannaria fowleri* new species**

Fig. 14.

A notably small form like other members of the genus. The dorsum is brown, in part dusky, with the keels alone yellow.

None of the coxae or sternites spined.

The gonopods of the male, with both blades evenly curved and parallel, the principal or posterior blade but little longer than the anterior. See further the illustration (fig. 14).

Width, 4.8 mm.

Locality.—Maryland: Garrett County, Jennings. One male, holotype, taken in July, 1907, by W. Stone and H. W. Fowler. [Academy of Natural Sciences of Philadelphia, Type no. 9951.]

In size about the same as *N. media* Chamberlin, but in the latter the principal blade of the gonopods is geniculate near the beginning of the distal third.

***Sigmoria gracilipes* new species**

Fig. 15.

The type specimen is brown, possibly faded from chestnut, with yellow bands across caudal borders of tergites, these bands expanding at their ends on the keels.

Posterior coxae with conical processes at distal ends.

Differing from *S. aberrans* of North Carolina and *S. conclusa* of Tennessee in the form of the male gonopods as represented in figure (fig. 15).

Length, about 42 mm.; width, 10 mm.

Locality.—Kentucky: Stone Mt. One male, holotype, taken April 30, 1921, by Witmer Stone. [Academy of Natural Sciences of Philadelphia, Type no. 9952.]

***Tucoria dynama* new species**

Fig. 16.

The holotype, faded in alcohol, shows the keels and a narrow transverse band on caudal border of typical tergites to have been lighter in color, probably yellow, the band widest at middle and on anterior segments reduced to a median spot. The cross band rather obscure and obviously darker than the keels.

Coxae of median and posterior portions of body with subconical spines at distal end.

The gonopods of the male are of the general form characterizing the genus but are distinct from those of the related *T. kentuckiana* in the details of the distal portion in particular as shown in the illustration (fig. 16).

Length of male holotype, about 49 mm.; width, 11 mm.

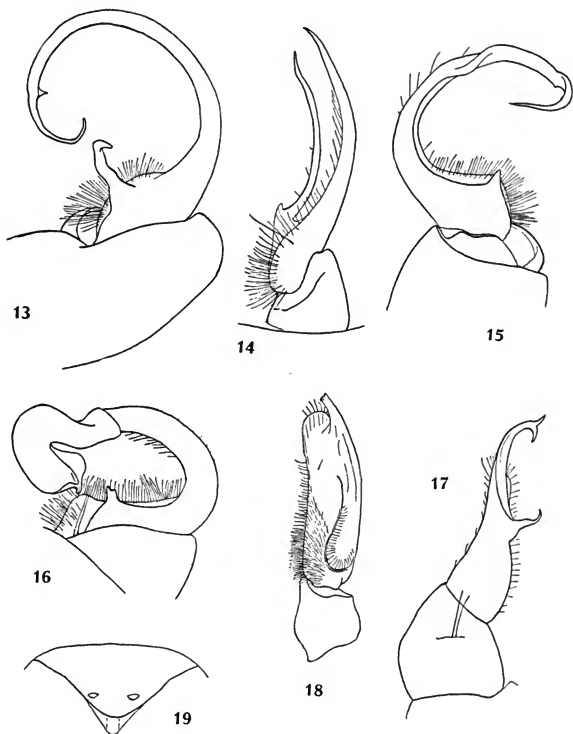


FIG. 13.—*Dixoria dentifer* n. sp. Right gonopod of male, subanterior view. FIG. 14.—*Nannaria fowleri* n. sp. Left gonopod in situ, ventral view. FIG. 15.—*Sigmoria gracilipes* n. sp. Right gonopod of male, subanterior view. FIG. 16.—*Tucoria dynama* n. sp. Right gonopod, cephalic aspect. FIG. 17.—*Rhysodesmus seriatus* n. sp. Gonopod of male, subdorsal view. FIG. 18.—*Aceratophallus guatemalae* n. sp. Left gonopod of male, view a little mesad of ventral. FIG. 19.—The same. Anal scale.

Locality.—Kentucky: Pine Mt. One male, holotype, taken Apr. 20, 1921, by Witmer Stone. [Academy of Natural Sciences of Philadelphia, Type no. 9953.]

***Zinaria butleri* (McNeill)**

Polydesmus butleri McNeill, Bull. Brookville Soc. Nat. Hist., 1888, no. 3, p. 6.

Fontaria virginensis Wood (not of Drury), Trans. Am. Phil. Soc., 1865, vol. 13, p. 221.

MICHIGAN: Several specimens taken by M. Miles; no date recorded.

PENNSYLVANIA: A number of specimens without more definite locality.

This species has most commonly been referred to as *Fontaria virginensis*, a name, however, properly pertaining to a quite different species.

***Rhysodesmus seriatus* new species**

Fig. 17.

Tergites over prozonite and anterior portion of metazonite and keels somewhat clay colored with a dilute olive yellow tinge, the posterior portion of metazonites reddish, the reddish band contrasting sharply with the keels and other parts of tergite. The legs are darker than the dorsum, being light brown in color.

Across the metazonite the type shows two series of well, and more or less evenly spaced dots, the points of insertion of setae, but these series sometimes irregular; a third series of dots across anterior borders near prozonite. None of posterior angles of anterior and middle region produced, the caudal and lateral margins convex.

Gonopods as shown in fig. 17.

Length of male holotype, 32 mm.; width, 6 mm.

Locality.—Mexico: Cieneguillas, Nuevo Leon; one male, holotype taken at an elevation of 7,900 ft. on June 28, 1934 by H. A. Pilsbry. [Academy of Natural Sciences of Philadelphia, Type no. 9954.] Also two males and one immature specimen taken by the same collector on June 27, 1934, at Pablillo in the same state, and a male in the Sierra de Penetente, Saltillo to Diamante, July 15, 1934, at an elevation of 7,800 ft.

Differing from *R. garcianus*, which also occurs in Nuevo Leon (at Garcia), in color, greater breadth. In the gonopods the dorsal, subbasal, spine is larger.

RHACODESMIDAE

***Aceratophallus guatemalae* new species**

Figs. 18 and 19.

This species agrees with *unicolor* and the other species previously known, in general structure but differs from them clearly in the features of the gonopods, as, e.g., conspicuously in the low, evenly convex outer lobe at the distal end. The inner distal process is also of distinct form, at its tip lacking the button-like expansion as shown in the figure (fig. 18). The form of the anal scale is represented in fig. 19.

Keels of ordinary segments large, rising a little above the horizontal plane, especially those of the posterior region. Lateral margins thickened,

with the pores opening upward. A distinct tooth on the anterior corner of keels behind the collum excepting those of the more caudal segments. Caudal angles of posterior segments acutely produced, those of the 18th segment longest.

The genital processes from the coxae of the second legs, etc. are in general as in other species.

Width, 6 mm.

Locality.—Guatemala: Piedras Negras. June 30, 1933. Two males taken by D. W. Amram. [Academy of Natural Sciences of Philadelphia, Type no. 9955.]

***Ceuthauxus nuevus* (Chamberlin)**

MEXICO: Nuevo Leon, Cieneguillas. A female referred to this species was taken at an elevation of 7,900 ft. by Dr. H. A. Pilsbry on June 28, 1934.

The types of this species also came from the state of Nuevo Leon at Sabinas Hidalgo.

***Ceuthauxus mediator* new species**

Fig. 20.

Dorsum dull olive with borders of keels brown or brownish yellow. Legs pale brown.

Keels of segments immediately following the first with a minute denticle at anterior corner, otherwise smooth.

Readily distinguished from *C. nuevus* and other known species by the form of the telopodite of the gonopods, the terminal process of which seems sharply to contrast with that of other known species. See further fig. 20.

The caudally directed processes of the coxae of the second legs are of moderate length and the processes of the coxae of the third legs are in the form of short, bent cones.

Width, 5 mm.

Locality.—Mexico: Nuevo Leon, Pablillo. One male, holotype, taken June 27, 1934 by H. A. Pilsbry. [Academy of Natural Sciences of Philadelphia, Type no. 9956.]

***Ceuthauxus potosianus* new species**

Fig. 21.

Resembling *C. nuevus*, the generotype, and differing from *C. palmitonus* in having body and legs olivaceous in color.

Keels with lateral margins convexly rounded, smooth, with no tooth at anterolateral corner.

Telopodite of gonopods of male comparatively large and clearly exposed in ventral view. Its structure, represented in fig. 21, readily separates it from *nuevus* and the other known species.

Width from 5 mm. (♂) to 6 mm. (♀).

Locality.—Mexico: San Luis Potosi, Alvarez. A male, holotype, and female taken by H. A. Pilsbry on July 30, 1934. [Academy of Natural Sciences of Philadelphia, Type no. 9957.] A second female was taken at "Klm. 53 Potori y Rio Verde R." on July 31, 1934.

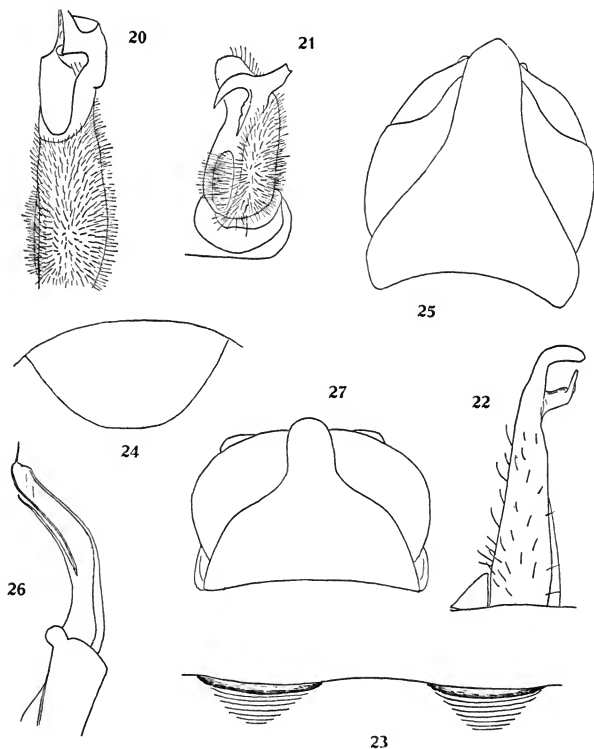


FIG. 20.—*Ceuthauxus mediator* n. sp. Left gonopod of male, ventral view. FIG. 21.—*Ceuthauxus potosianus* n. sp. Left gonopod, subventral view. FIG. 22.—*Platyrrhacus atratus* n. sp. Gonopod of male. FIG. 23.—*Rhinocricus vagans* n. sp. Scabina of eighteenth segment. FIG. 24.—The same. Anal scale. FIG. 25.—*Rhinocricus tidius* n. sp. Anterior gonopods of male, anterior view. FIG. 26.—The same. Posterior gonopod. FIG. 27.—*Rhinocricus cocos* n. sp. Anterior gonopods, cephalic view.

EURYURIDAE**Euryurus erythropygus** (Brandt)

KENTUCKY: Pine Mt.; April 30, 1921; several specimens taken by W. Stone.

Auturus mimetes Chamberlin

MISSOURI: Chadwick; 1903; two specimens collected by Dr. H. A. Pilsbry.

Amplinus klugi (Brandt)

MEXICO: Vera Cruz, La Ruina de Ventura, near Santa Rosa, Isthmus of Tehuantepec; several specimens.

PLATYRRHACIDAE**Platyrhacus atratus** new species

Fig. 22.

Dorsum nearly chocolate colored, without any lighter stripes but the keels light brown. Legs also brown.

Collum with a series of large tubercles on anterior border, across dorsum between keels, series set off by a depression or furrow caudad of it. Posterior border also with a series of large tubercles between keels while the remaining part of collum is covered with smaller, less elevated tubercles and granules. Keels studded with smaller tubercles (fig. 22).

Keels of ordinary segments of the usual general form the anterior margin being convex and the posterior concave, with the caudal corner becoming in posterior region strongly and subacutely produced excepting those of the 19th which are rounded. Characterized especially by having only a single series of tubercles across dorsum, this lying along the caudal border and composed of small, well-separated tubercles. Surface of tergite between keels otherwise appearing finely roughened under the lens. Upper surface of keels roughened with coarser granules; lateral margin showing five or six rounded teeth or scallops. Repugnatorial pore about one-third the distance from lateral margin to base of keel.

The gonopods of the male as shown (fig. 22).

Total width, 12-13 mm.

Differing from the Colombian *P. clathratus* in its much smaller size and in lacking acute teeth on the lateral margins of the keels; also differing from this and other related species in having only a single series of tubercles across dorsum of each tergite.

Locality.—Colombia. "300 miles up the Atrato River, in the woods." The male holotype and an imperfect female taken in October, 1896. [Academy of Natural Sciences of Philadelphia, Type no. 9958.]

JULIDAE**Julus moreleti** Lucas

BERMUDA: Two immature specimens taken in 1888 by the Heilprin Expedition. Also 6 specimens taken on Harington Sound, Feb. 1-5, 1945, by E. G. Vanatta.

Diploius hortensis Wood

Julus hortensis Wood, Proc. Acad. Nat. Sci. Phila., 1864, p. 14; Trans. Am. Phil. Soc., 1865, p. 205.

Julus luscus Meinert, Naturh. Tidsskr., 1868, 3R., vo. 5, p. 9.

Julus owenii Bollman, Entom. Amer., 1887, vol. 2, p. 228.

Julus frisius Verhoeff, Berl. Ent. Zeits., 1891, 36, Hft. 1, p. 133.

Julus hesperus Chamberlin, Canad. Ent., 1914, p. 314.

NEW JERSEY: Greenwich; numerous specimens without further data.

PENNSYLVANIA: Delaware County; Mar. 24, 1914, one male taken by D. E. Culver.

This small form was, without doubt, introduced from Europe in early days and is still frequently taken at quarantine in soil about imported bulbs, etc. It has long been common in Pennsylvania and other eastern states and is now found across the country in cultivated tracts as far west as Utah and California (Los Angeles, Santa Barbara, etc.). In Europe in recent years the form has most frequently been designated as *frisius*. The present writer has heretofore adopted Meinert's name *luscus* for it, but he now believes there is no doubt that this is the species Wood had before him when he described his *hortensis*, a name which must therefore be used.

Diploius londinensis caeruleocinctus (Wood)

Julus londinensis Leach, Trans. Linn. Soc. London, 1814, vol. 11, p. 378.

Julus caeruleo-cinctus Wood, Proc. Acad. Nat. Sci. Phila.; 1864, p. 14; Trans. Am. Phil. Soc., 1865, vol. 13, p. 204.

Julus multistriatus Walsh, Practical Ent., 1866, vol. 2, p. 34 and 70.

Julus teutonicus Pocock, Ann. Mag. Nat. Hist., 1900, p. 206.

Cylindroiulus londinensis teutonicus Jackson, Lanc. and Ches. Nat., p. 433.

MASSACHUSETTS: West Barnstable; Aug. 26, 1919; several immature specimens taken by B. Long. NEW YORK: Ithaca; May 1, 1936; six specimens taken by J. H. W. Rehn.

Another species apparently introduced from Europe and now very common from Canada to Pennsylvania and the District of Columbia and as far west as Indiana and Illinois.

Ophyiulus pilosus (Newport)

Julus pilosus Newport, Proc. Ent. Soc. London, 1842; also Ann. Mag. Nat. Hist., ser. 1, vol. 11, p. 316.

Julus longabo C. Koch, Die Myriap., 1847, vol. 2, p. 106.

Julus canaliculatus Wood, Proc. Acad. Nat. Sci. Phila., 1864, p. 12.

Julus laqueatus Wood, ibid., p. 13.

Julus fallax Meinert, Naturh. Tidsskr., 1868, 3 R., vol. 5, p. 15.

This European form is exceptionally well established in New Jersey and Pennsylvania, especially in and about Philadelphia where it would seem already to have been abundant in Wood's day. It is established about Quebec in Canada but seems to be rare in New England.

NEW JERSEY: Ventnor; August, 1909; numerous specimens taken by Dr. H. A. Pilsbry. Camden, Haddon Hts.; Apr. 15, 1915; about a dozen not fully grown specimens collected by Bayard Long. Camden, Laurel Springs; Oct. 26, 1918; ten specimens taken by Bayard Long. Swedesboro; Nov. 1, 1916; several. Also two taken Apr. 17, 1917 by Bayard Long. Cape May County; Oct. 7, 1916; several.

NEW YORK: Ithaca; May 1, 1936; three specimens taken by J. W. H. Rehn.

PENNSYLVANIA: Bucks County, near Lumberville; July 22, 1914; one female taken by H. W. Fowler. Woodbourne; Oct. 15, 1915; a male and female taken by H. W. Fowler. Chester County; Apr. 3, 1912; several taken by E. G. Vanatta. Delaware County, Glenolden; Apr. 14, 1920; one male taken by J. B. Clark. Also at Newton Square; Apr. 23, 1912; several by Bayard Long. Lancaster County; Nov. 17, 1912; one female taken by E. G. Vanatta. Montgomery County, Paper Mills; Apr. 21, 1912; two specimens taken by Bayard Long. Also at Ashbourne; Dec. 25, 1911; one specimen, Bayard Long coll. And at Gladwyne; three specimens coll. by V. Blucher, A. Thompson and H. L. Mather, Jr. Fullertown, Cash Point; Apr. 18, 1915; one female. H. W. Fowler coll. Philadelphia, Holmesburg; Dec. 15, 1912, Jan. 26, and Mar. 23, 1913 and Mar. 20, 1904; numerous specimens collected by H. W. Fowler. Philadelphia, Rowlands; Mar. 29, 1914; three taken by H. W. Fowler.

BERMUDA: Harrington Sound; July 5, 1925; J. B. Clark, coll.

This is another species introduced from Europe and now common in several of the eastern states, such as New Jersey and Pennsylvania, where it seems now to be the most abundant diplopod. It has similarly established itself in New Zealand.

PARAIULIDAE

Aniulus venustus (Wood)

PENNSYLVANIA: Bucks County, Edderton; Nov. 11, 1909; one male taken by H. W. Fowler. Also at Woodbourne; Oct. 15, 1915; a male and female; H. W. Fowler, coll. Bristol; Sept., 1912; one female, H. W. Fowler, coll. Edgehill; Apr. 16, 1893; a male and female collected by P. Nell. Leshanning Falls; Sept. 16, 1915, one female; H. W. Fowler coll.

Ptyoiulus pennsylvanicus (Brandt)

PENNSYLVANIA: Bristol; a male and female taken Sept. 6, 1908 by H. W. Fowler. Philadelphia, Holmesburg; Mar. 23, 1913. Many specimens taken by H. W. Fowler. Philadelphia, Fairmount Park; Oct. 16, 1910; one female taken by E. G. Vanatta. Folsom, Oct. 30, 1892; several males and females collected by P. Nell.

RHINOCRICIDAE***Rhinocricus vagans* new species**

Figs. 23 and 24.

Color chocolate with all segments ringed about caudal border with ferruginous or light brown. Legs light.

Head with median longitudinal sulcus widely interrupted opposite antennal sockets. Eyes subcircular but more flattened posteriorly, separated by fully twice their diameter; ocelli in 7 transverse series. Sensory cones of antennae numerous.

Collum rather widely rounded below; a submarginal sulcus below and up anterior border to level of eye; two transverse impressed lines or sulci over dorsum crossed below on each side by a longitudinal sulcus.

Second tergite extending well below level of end of collum, only moderately depressed on anterior border for reception of the collum.

Ordinary tergites with principal sulcus strongly impressed across dorsum as well as down the sides. Longitudinal striae in front of segmental sulcus somewhat oblique, the series extending to the pore; striae behind sulci strictly longitudinal, fewer in number than those in front and the series not extending to the pore. Pore contiguous with the segmental sulcus.

Scobina weakly developed on the eighth segment as a series of striae. Farther back the scobina consist of a deep and long transverse depression close to the anterior border followed by a series of coarse striae as shown in fig. 23, the scobina separated by about their width. Caudal edge of metazonite strongly sinuous opposite each scobinum of the succeeding segment. Scobina disappearing in front of the 25th segment.

Anal tergite without transverse furrow, much exceeded by the anal valves. Anal valves strongly compressed and elevated mesally. Anal scale of form shown in fig. 24.

Number of segments, 42.

Length, about 103 mm.; diameter, 15 mm.

From the Mexican *R. lamprus* Chamberlin, which resembles it in size, distinct in the smaller number of body segments (42 as against 53), in having the scobina closer together and disappearing in front of the twenty-fifth segment instead of continuing to near the forty-second.

Locality.—California: Fort Tejon. Holotype ♀. [Academy of Natural Sciences of Philadelphia, Type no. 9959.]

This species seems to be well distinguished by its large, robust form in conjunction with the relatively few segments, the numerous cones of the antennae, its color pattern, and the sulci of the collum.

***Rhinocricus tidius* new species**

Figs. 25 and 26.

An exceptionally small form which, after obviously long preservation leaves the original coloration doubtful, although it was probably dominantly chestnut with the legs paler, probably light brown or yellow.

Eyes subcircular and widely separated as usual. Sensory cones of the antennae numerous.

Collum with ends widely rounded; a wavy longitudinal sulcus at level of lower end of eye but transverse sulci not evident across dorsum.

In the ordinary segments the posterior segmental sulcus is distinct up sides and across dorsum as well, curved at level of pore the posterior part of the rim of which it closely embraces. A somewhat less distinct secondary sulcus runs from anterior edge of pore across dorsum. Very oblique striae over belt in front of sulcus present up to level of pore, striae on posterior belt present only below. Scobina in form of small but deep crescentic impressions separated by about twice their diameter or more posteriorly where they become reduced before finally disappearing; no distinctly developed striae are behind the impressions.

Last tergite with a transverse furrow setting off caudal portion, a little exceeded by the valves.

Gonopods of the male as shown in figures 25 and 26.

As all the type specimens are broken, it was impossible to make sure of the number of segments.

Diameter, 5 mm. and less.

In the presence of a well-developed secondary segmental sulcus, suggesting *R. omiltemae* of Guerrero, Mexico, which is an even smaller form. From the latter it differs, aside from larger size, in not having the first tergite expanded and in the structure of the gonopods as illustrated.

Locality.—California: Fort Tejon. A number of males and females, all now broken. Holotype ♂. [Academy of Natural Sciences of Philadelphia, Type no. 9960.]

The small size, presence of the secondary sulcus across dorsum, and especially the details of the gonopods of the male should make this species easily recognized among those having numerous sensory cones on the antennae.

Rhinocricus potosianus Chamberlin

MEXICO: Jalapa. A male and female taken by R. M. DeOca.

Previously recorded by the author from Tamaulipas and San Luis Potosi.

Rhinocricus monilicornis (Porath)

BERMUDA: Harrington Sound. Feb. 1-5, 1910. E. E. and E. G. Vanatta, coll. One female specimen of this West Indian species which seems to be common on the Bermudas.

Rhinocricus cocos new species

Figs. 27 and 28.

An exceptionally small form for this genus with distinctive features in both anterior and posterior gonopods as represented in figures 27 and 28.

Somewhat orange brown in color, with narrow darker annuli over posterior border of the segment. Legs yellow.

Clypeal foveolae 2 + 2. Sensory cones of antennae, 4. Eyes widely separated as usual, their ocelli in 6 or 7 longitudinal series.

Collum smooth, lower end widely rounded.

In the male the coxal processes of third, fourth and fifth legs subequal, of moderate size.

Segmental sulcus sharply impressed throughout. Last tergite widely rounded behind, much exceeded by the anal valves.

Scobina present; these have the submarginal lunate area deeply depressed and the striae fine and weak, their area brief; impressions on the middle segments once and a half or less their width apart.

Number of segments, 48-49.

Width, 3 mm.

Much smaller in size than *R. salleanus* and other Central American and Mexican species in which the sensory cones of the antennae are but four.

Locality.—Cocos Is.; Chatham Bay. A male, holotype and female. [Academy of Natural Sciences of Philadelphia, Type no. 9961.]

***Rhinocricus arboreus gundlachi* Karsch**

Locality.—Porto Rico: A male and female taken in the Arecibo River at Estrada in June, 1915, by C. F. Silvestri.

The male shows the dorsal series of red spots characteristic of this variety and has the legs dark with the tarsi in considerable part orange colored. The female, however, has the dorsal spots black and the legs of uniform color which is much lighter than that of the legs of the male.

***Rhinocricus edenus* new species**

Figs. 29-32.

Prozonites light brown with the metazonites chestnut becoming more reddish at caudal border above. Legs yellow. Antennae light brown.

Clypeal foveolae 2 + 2. Antennae bearing numerous sensory cones. Ocelli in 6 transverse series; e.g., 7, 7, 6, 5, 4, 3.

Collum smooth, well rounded below and with no anterior sulcus. Second tergite extending well below level of lower end of collum.

On the following segments the sulcus is obsolete above, but traces of it are found in a shallow transverse furrow across dorsum.

Last tergite of form shown in fig. 29; roughened with irregular coarse rugae except on caudal process, much exceeded by the anal valves. Last sternite of form shown in fig. 30.

The form of the sternite of the anterior gonopods seems to be distinctive (fig. 31). For features of the posterior gonopods see fig. 32.

Number of segments, 43.

Width, 10 mm.

In comparison with the related Nicaraguan species *R. rixi* Pocock, a somewhat smaller form in which the color is brown instead of black, and the legs yellow instead of black or partly black.

Locality.—Nicaragua: Eden. One male, holotype, taken by W. Huber on June 4, 1922. [Academy of Natural Sciences of Philadelphia, Type no. 9962.]

***Rhinocricus simulans* new species**

Figs. 33-35.

Color chestnut, with caudal portion of metazonite of segments lighter, more or less reddish yellow or orange. Legs yellow, of slightly orange tinge.

Antennae short and thick, the terminal article bearing numerous sensory cones.

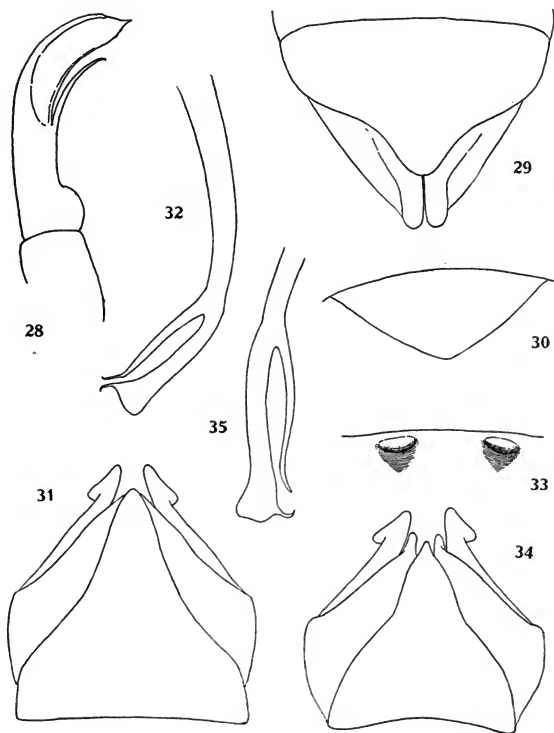


FIG. 28.—*Rhinocricus cocos* n. sp. Telopodite of posterior gonopod. FIG. 29.—*Rhinocricus edenus* n. sp. Last tergite and anal valves, dorsal view. FIG. 30.—The same. Anal scale. FIG. 31.—The same. Anterior gonopods, anterior view. FIG. 32.—The same. Distal part of telopodite of right posterior gonopod, mesal view. FIG. 33.—*Rhinocricus simulans* n. sp. Scobina. FIG. 34.—The same. Anterior gonopods of male, anterior view. FIG. 35.—The same. Distal end of telopodite of a posterior gonopod.

Primary sulcus of segments distinct and complete, tangent to pore. Tergites smooth and shining above.

Last tergite angular pointed behind, the angle nearly rectangular, not at all rounded. Anal scale subtriangular with base convex, and the apex but little rounded.

Differing from *tristani* and *nicaraguanus*, with which it has close affinities, in the larger scobina which also on the middle segments are separated by only about twice their transverse length instead of by four times or more. (See also fig. 33).

The characters of the gonopods are shown in figs. 34 and 35.

Number of segments, 45.

Diameter, 10 mm.

Locality.—Nicaragua. One male, holotype, taken by E. Wright on the "N. P. Exped." [Academy of Natural Sciences of Philadelphia, Type no. 9963.]

***Rhinocricus venefica* new species**

Figs. 36 and 37.

This species belongs to the group in which the terminal article of the antennae bears numerous sensory cones. Clypeal foveolae $2 + 2$.

The scobina consist each of an anterior, well-defined sublunate impression followed by very fine striae which form a rather short area widely rounded at its caudal end; separated by more than twice their diameter.

Anal tergite well rounded behind and with the caudal end free.

In the male the lamellate coxal processes of the third and fourth legs are exceptionally large and distally pointed, those of the fifth and, much more those of the sixth legs, shorter and distally blunt.

Characterized especially by the gonopods of the male. In these the sternite of the anterior has an especially long and slender median distal process and the coxae of this pair are proportionately large. The posterior pair is characterized by having the outer branch in the form of an evenly acuminate blade not at all expanded distally. See further figs. 36 and 37.

Number of segments, 52.

Width, 9 mm.

Differing from the Brazilian *R. limbatus* and *R. sericiventris* in the long and slender median process of the sternite of the anterior gonopods. This process is somewhat as in *R. pugio*, but the latter is a much smaller species.

Locality.—Paraguay. One male, holotype, taken by Capt. T. J. Page of the U. S. Ship "Water Witch". [Academy of Natural Sciences of Philadelphia, Type no. 9964.]

***Rhinocricus pedrocicola* new species**

Figs. 38 and 39.

Preserved specimens dark brown over the exposed part of the prozonites and a lighter brown over the metazonites. Head and anal segment light brown. Antennae and legs yellowish of a slightly ferruginous tinge.

Antennae moderate in length, with sensory cones very numerous; none of joints tuberculate. Head smooth; clypeal foveolae $2 + 2$; median sulcus interrupted opposite bases of antennae. Eyes comparatively small, very widely separated, their ocelli not strongly convex.

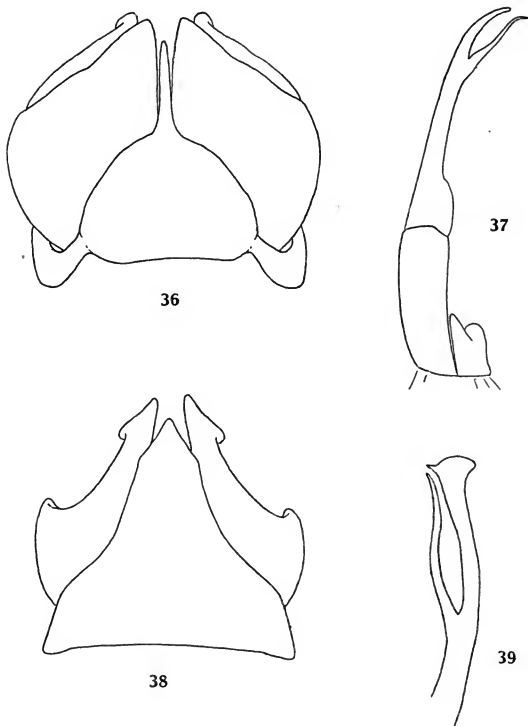


FIG. 36.—*Rhinocricus venefica* n. sp. Anterior gonopods, cephalic aspect. FIG. 37.—The same. Posterior gonopod. FIG. 38.—*Rhinocricus pedrocola* n. sp. Anterior gonopods, cephalic aspect. FIG. 39.—The same. Distal end of a posterior gonopod.

Collum well rounded below, smooth throughout.

Segmental sulcus only obscurely indicated on sides on most segments, and essentially obliterated above, its position indicated by a shallow and shining furrow, striate only beneath.

Anal sternite long, its caudal margin strongly and nearly evenly convex. Anal valves much exceeding the last tergite. The latter obtusely angled behind but with the apex rounded.

The characters of the male gonopods are shown in figs. 38 and 39.

Number of segments, 45-46.

Length, 112 mm.; thickness, 12 mm.

Locality.—Panama: Canal Zone at Pedro Miguel. One male, holotype, taken July 19, 1915 by D. Harrower. [Academy of Natural Sciences of Philadelphia, Type no. 9965.]

Among species possessing numerous sensory cones on the antennae, perhaps nearest to *R. rixi* Pocock, of Nicaragua, but differing in the paler legs and antennae, the lack of granulae on the 5th and 6th articles of the antennae, in the shorter, relatively broader scobinae with striae fine and often only vaguely defined, as well as in the details of the gonopods.

***Rhinocricus mayanus* new species**

Figs. 40 and 41.

Very close to *R. motulensis* Chamberlin, which was also described from Yucatan at Motul (San Bulha Cenote). It is a somewhat smaller form, the thickness of the type being 8 mm. as against 9.5 mm. As nearly as can be judged from the preserved specimen its color is lighter, being mostly orange brown but darker in front of the segmental sulcus on each segment whereas *motulensis* is nearly black except for a narrow annulus on the caudal border of the metazonite. It shows a fine submarginal sulcus on the collum along its antero-inferior border not evident in *motulensis*. The scobina are smaller and more widely separated than in the latter species. So far as the holotypes go, there is a readily observed difference in the form of the anal scale as shown in the accompanying figures (figs. 40 and 43).

The gonopods are very close but in *mayanus* the sternite is distally relatively narrower with the narrow terminal lobe much longer. (See figs. 41 and 42).

Number of segments, 65.

Width 8 mm. or slightly more.

Locality.—Yucatan. One male, holotype, taken on the "Mexican Exped. of 1890-91". [Academy of Natural Sciences of Philadelphia, Type no. 9966.]

***Rhinocricus diastatus* new species**

Figs. 44 and 45.

This is one of the relatively very few species of the Australian region having the true *Rhinocricus* form in the furcate distal end of the posterior gonopods. It seems readily distinguishable by the details of the gonopods as shown in figures 44 and 45.

General color nearly black with caudal border of metazonites chestnut. Legs chestnut.

Antennae with four sensory cones. Clypeal foveolae 2 + 2. Under the lens showing numerous transverse sulci running out on the vertex and front from the median longitudinal sulcus. Eyes very widely separated, their ocelli arranged in 10 longitudinal series.

In the male the coxal processes of third and fourth legs low.

The scobina consisting of a deep lemate impression followed by about a dozen coarse striae; separated by about twice their width.

Segmental sulcus obsolete on dorsum.

Collum above each rounded lower end with a broad but definite curved furrow parallel with the margin.

Last tergite caudally triangular, the end obtusely rounded, slightly free.

Number of segments, 54.

Width, 10 mm.

Differing from the related *R. perditus* Chamberlin of Queensland in larger size and details of the male gonopods as illustrated.

Australia: Palm Island. Male holotype taken in 1923 by H. A. Pilsbry. [Academy of Natural Sciences of Philadelphia, Type no. 9967.]

Cubocricus angustipes (Loomis)

Alcimobolus angustipes Loomis, Bull. Mus. Com. Zoölogy, 1936, vol. 80, No. 1, p. 57, figs. 23 a and b.

DOMINICAN REPUBLIC. A male and female collected by W. B. Gabb.

The original label in the vial containing these specimens reads (San Domingo, Cal.); but Mr. Rehn writes that "there is no question from the information you have given but what the material labelled 'Lot 1143' came from the Dominican Republic, as we have in a number of groups extensive collections made in that country by Gabb."

These specimens seem to differ from the type of the species in the better developed anterior sulcus on the collum and in having the posterior segmental sulcus distinct across the dorsum. The number of segments is 48 (♂) and 50 (♀).

SPIROLOBIDAE

SPIROBOLUS

The genus *Spirobolus* as conceived by Brandt in 1833 embraced two species, *S. olfersi* from Brazil and *S. bungi* from China. Neither of these is identifiable from Brandt's account and no types exist. In all probability the Brazilian species would fall in *Rhinocricus*, separated by Karsch in 1881, or some related genus. The Chinese species is essentially a nomen nudum. Apparently the first recognizable species placed under *Spirobolus* was the North American *marginatus* Say. Both Newport and Wood used the combination *Spirobolus marginatus*. I am therefore in accord with Brolemann

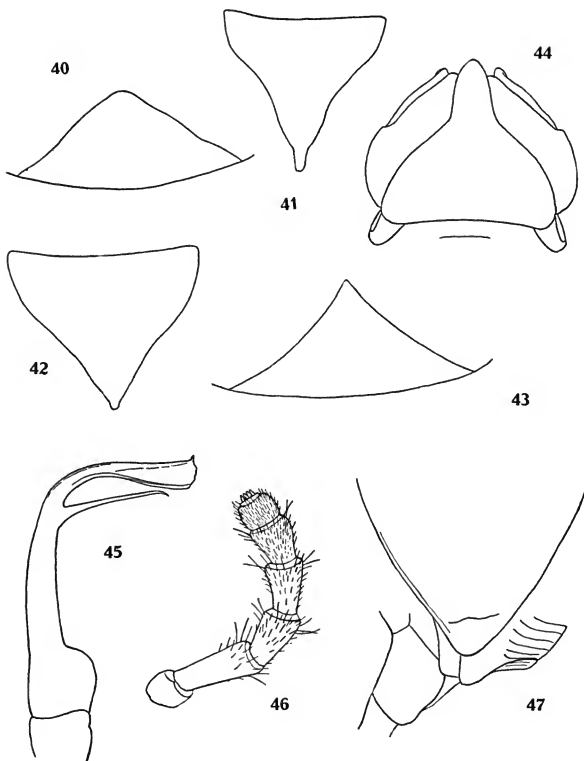


FIG. 40.—*Rhinocricus mayanus* n. sp. Anal scale. FIG. 41.—The same. Sternite of anterior gonopods. FIG. 42.—*Rhinocricus motulensis* Chamberlin, Sternite of anterior gonopods. FIG. 43.—The same. Anal scale. FIG. 44.—*Rhinocricus diastatus* n. sp. Anterior gonopods, cephalic aspect. FIG. 45.—The same. Left posterior gonopod, anterior view, more enlarged. FIG. 46.—*Chicobolus pilsbryi* n. sp. Right antenna. FIG. 47.—The same. Lower part of collum from the left side, with cardo of mandible.

in regarding *marginatus* as the valid generotype of *Spirobolus*. *Arctobolus*, proposed by O. F. Cook in 1904 for the North American species, is thus regarded as a synonym of *Spirobolus*.

***Spirobolus orophilus* Chamberlin**

KENTUCKY: Pine Mt. One male taken April 30, 1921. A somewhat lighter specimen than the type examples which are from the Smoky Mts. at Gatlinburg, Tennessee.

***Spirobolus marginatus* (Say)**

This species as conceived on the basis of the gonopods and secondary sexual characters of the male, is widespread in the eastern and southeastern states and seems to be subject to much variation as to the size of sexually mature individuals. Of localities represented by specimens in the Academy of Natural Sciences of Philadelphia the following may be noted.

FLORIDA: Several large specimens, date and collector not given. NEW YORK: Essex County, Westpoint, H. A. Pilsbry, 1922. Hanging Rock Falls, near Ellenville, Ulster Co., H. N. Wardle coll. Sept. 1921. RHODE ISLAND: Exeter, Jonathan Record coll. PENNSYLVANIA: Bucks County, White's Island in Delaware R., Aug. 10, 1913, D. C. Culver coll. Near Emilie, Sept. 7, 1908, H. W. Fowler coll. Near Muncy. A female probably this species, P. Nell coll.

***Spirobolus spinigerus* Wood**

FLORIDA: Paradise Key, April 1919, W. S. Brooks and Mossier, coll. Lake Okechobee, Observation Island. Heilprin coll., 1886. Kissimmee River, 50 mi. south of Kissimmee, Joseph Willcox coll., 1904. Avon, June 6, 1929, one large female.

CHICOBOLUS new genus

In general structure agreeing with *Spirobolus*, it similarly lacks scobina and has the collum narrowed down the sides. It differs from that genus in having the supralabral setigerous foveolae $6 + 6$ instead of $4 + 4$. Characters of the male unknown.

GENEROTYPE.—*Chicobolus pilsbryi*, new species.

***Chicobolus pilsbryi* new species**

Figs. 46 and 47.

Body solid black or bluish black except for a narrow ring of largely obscure chestnut about caudal border of tergites. Legs yellow, of ferruginous tinge. Head black over vertex, frontal and clypeal regions yellow ferruginous.

Clypeal foveolae $6 + 6$. Antennae with joints as shown in fig. 46. Head smooth and shining, no median sulcus over vertex of head. Eyes large, widely separated, surface of ocelli not convex. Ocelli in 8 longitudinal series; e.g., 6, 7, 7, 7, 6, 6, 5, 3.

Collum narrowed down each side as shown in fig. 47; anteriorly with a fine margining sulcus from level of eye downward, but this sulcus not extending about lower end or at least obscurely indicated there. Second tergite produced beneath ends of collum as shown in the figure.

Repugnatorial pores beginning on sixth segment. Pores large and contiguous with posterior segmental sulcus on anterior side where it forms an angle at level of longitudinal sulcus. Tergites smooth and shining above, on sides below with numerous oblique longitudinal sulci.

Anal tergite smooth proximally but coriaceously roughened caudally, the triangular caudal area set off by a transverse sulcus. Anal valves smooth or but sparsely punctate, strongly compressed and raised mesally, exceeding the tergite.

Number of segments, 50.

Length, about 88 mm.; maximum diameter, 10 mm., the body strongly narrowed at anterior end.

Locality.—Florida: Boca Chica Key. One female, holotype, taken by H. A. Pilsbry in 1907 on the Clement B. Moore expedition. [Academy of Natural Sciences of Philadelphia, Type no. 9968.]

Aztecocolus pablillo new species

Figs. 48 and 49.

Differing superficially from *A. nigrrior*, the generotype, in smaller size and lighter color of body and legs. Tergites greenish gray with annuli which are chestnut brown above and paler or fading out down the sides. Legs light brown.

Clypeal foveolae 4 + 4.

As in *nigrrior* neither the anterior legs nor their claws are enlarged in the male, and the anterior coxae bear no true processes.

Gonopods conforming in general with those of *nigrrior* but differing in details, such as the more acutely prolonged apical process and the lack of a caudal tooth on the latter and the presence of denticles on the anterior rim proximad of this process, etc. See further fig. 49. For anterior gonopods see figure 48.

Number of segments, 51.

Width, 4.5 mm.

Locality.—Mexico: Nuevo Leon, Pablillo. One male, holotype, taken June 27, 1934 by Dr. H. A. Pilsbry. [Academy of Natural Sciences of Philadelphia, Type no. 9969.]

Aztecocolus nigrrior Chamberlin

Locality.—Mexico: Nuevo Leon, Pablillo. A female was taken by Dr. H. A. Pilsbry on June 27, 1934.

The types of this species were from Solinas Hidalgo in the same state.

LITOBOLUS new genus

Falling in the relatively small group of spirobolid genera in which the repugnatorial pores lie distinctly in the prozonite. From others in this group distinguished in having the posterior gonopods with telopodite in the form of a simple, slender blade; undivided; meeting in the middle line but

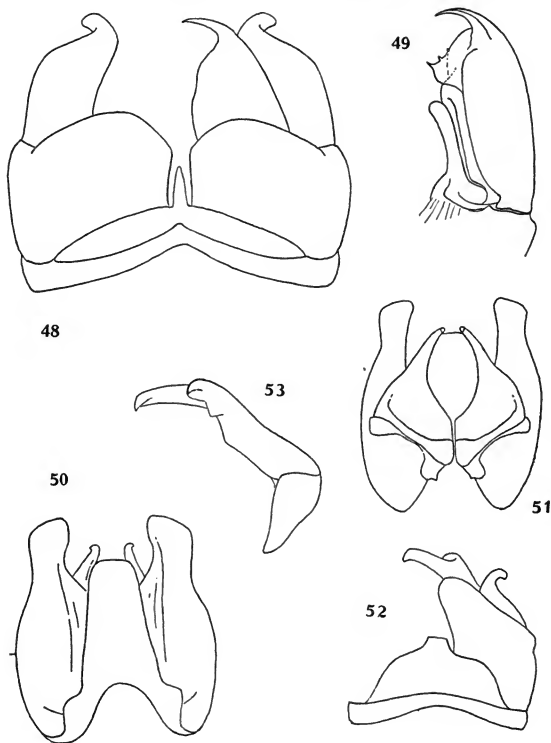


FIG. 48.—*Aztecolus pablillo* n. sp. Gonopods of male with left posterior one removed. FIG. 49.—The same. Left posterior gonopod, caudal view. FIG. 50.—*Litobolus hanevavus* n. sp. Gonopods of male, caudal view. FIG. 51.—The same. The gonopods viewed from behind. FIG. 52.—*Onychelus smithi* n. sp. Anterior sternite and right gonopods, anterior view. FIG. 53.—The same. Left posterior gonopod viewed from behind.

not at all united. Sternite of anterior gonopods well developed, elongate. Fifth legs of male with conspicuous, strongly sclerotized processes. Collum strongly narrowed down the sides. Anal valves with mesal borders compressed and elevated. Clypeal foveolae $2 + 2$. No scobina.

GENEROTYPE.—*Litobolus hanevavus* new species.

***Litobolus hanevavus* new species**

Figs. 50 and 51.

Color typically black or nearly so with narrow ferruginous annuli about caudal borders of metazonites. Legs ferruginous.

Clypeal foveolae $2 + 2$. Antennae short, each with four sensory cones. Eyes subcircular, widely separated.

Collum strongly narrowed down the sides, with an elevated anterior border set off by a sulcus which extends from the lower angle up to level of eyes.

On the following somites the segmental sulcus is distinctly impressed throughout, gently curved at the level of the pore which lies adjacent to it on the prozonite. The longitudinal striae on the metazonites distinct below, short above, the series not extending up to the pore.

Anal scale proportionately short and wide, with anterior margin straight or nearly so.

In the male the coxae of the third and fourth legs with relatively small and pale processes bent abruptly caudad; the coxae of the fifth legs with much larger, darker and more strongly sclerotized processes which project forward above base.

Gonopods as shown in figs. 50 and 51.

Number of segments, 51.

Width, up to 3.2 mm.

Locality.—Marquesas: Fatu Hiva Island, Hane Vava. Male holotype and five females taken by H. A. Pilsbry, Sept. 17, 1929, on the Pinchot South Pacific Expedition. [Academy of Natural Sciences of Philadelphia, Type no. 9970.]

ATOPETHOLIDAE

***Onychelus smithi* new species**

Figs. 52 and 53.

This form is black with but fine lighter annuli formed by the posterior overlapping rim of the metazonites. Anal valves solid black. The legs and antennae are dusky brown to nearly black.

Collum strongly narrowed down the sides, with the ventral angle produced moderately caudad; the anterior border thickened and elevated below and over lower part of anterior border.

Secondary modifications, of anterior legs of the male typical, the first two pairs of legs being thickened and bearing enlarged claws. Several following pairs also with claws elongate.

Clypeal foveolae $4 + 4$.

At once distinguished from the known species by the form of the posterior gonopods as e.g. in the elongate, much curved and distal toothed blade of the telopodite of the posterior pair. See further fig. 53.

Number of segments, 48.

Length, about 33 mm.; width 3.8 mm.

Differing from *O. obustus*, the generotype, in having the clypeal foveolae 4 + 4 instead of 5 + 5 and in the form of the telopodite of the posterior gonopods of the male.

Locality.—California: Colorado Desert, Riverside County in Murray Canyon, which is about 3 miles north of Palm Canyon.

A male and female taken in November 1946, by Mr. Lloyd M. Smith, Director of the Palm Springs Desert Museum, sent me by the collector, are the holotype and allotype of the species. Other specimens were collected by Mr. Smith. [Academy of Natural Sciences of Philadelphia, Type no. 9971.]

***Onychelus jaegeri* new species**

Figs. 54 and 55.

These millipeds are strikingly banded, the annuli in life, being silver and black, the black being over the prozonites, the silver over the metazonites, the black annulus narrows down the sides and terminates in a point before reaching the under surface. The legs are pale yellow or whitish.

The color pattern suggests that of *O. obustus* which was also described from the Colorado Desert, but in the latter species the light band is described as red above. The two species differ in that *obustus* had the clypeal foveolae 5 + 5, while in *jaegeri* they are 3 + 3, as well as in the gonopods.

The gonopods seem to be readily distinctive, the form and terminal tooth of the distal blade being characteristic. The anterior sternite of gonopods conspicuously different from that of *smithi* in having the apex prolonged and acute, instead of short and truncate. (See figs. 54 and 55.)

The collum does not have its lower end bent caudad, and the anterior submarginal ridge is less thickened than in *smithi*.

Number of segments, 45-46.

Length, 33-35 mm.; maximum width, 4 mm.

Locality.—California: Riverside County, Colorado Desert. Many specimens taken in an unnamed canyon in the Indio Mudhills about 10 miles northeast of Palm Springs in November, 1946, by Smith and Jaeger. Holotype male. [Academy of Natural Sciences of Philadelphia, Type no. 9972.]

***Arinolus chiricahuanus* new species**

Figs. 56-58.

A form of typical appearance for the genus. Brown in color with more brightly colored annuli about the metazonites. Metazonites somewhat more elevated than prozonites.

Eyes separated by about three times their diameter. Clypeal foveolae 4 + 4.

Collum strongly narrowed down the sides as usual, with the anterior marginating sulcus deeply impressed up to level of eye.

On the other tergites the median sulcus is distinctly impressed throughout. The series of longitudinal striae extending but part way up the sides, the tergites otherwise smooth.

Anal tergite well rounded behind, exceeded by the anal valves which are evenly inflated and have the mesal borders forming a reentrant angle, thus forming a median furrow.

In the male the first two pairs of legs are thickened and bear enlarged claws as usual; the claws of the other more anterior legs also enlarged. The usual sublamellate coxal processes on legs of third to seventh pairs.

In the male gonopods the sternite of the anterior pair narrower in relation to length, more triangular than in other known species, and the distal processes of the coxae of this pair are subcylindrical, not apically either acuminate or clavate. The posterior gonopods have the telopodite articulating at right angles to the transversely placed basal joint in the typical way. The telopodite with its distal portion of characteristic general form and with the tooth of the anterior side relatively slender. See further figs. 56, 57 and 58.

Number of segments, 42.

Width, 3 mm.

Differing from *A. torynophor*, the generotype, in having the clypeal foveolae 4 + 4 instead of 5 + 5, and from this and other known species in the details of the gonopods as illustrated.

Locality.—Arizona: Chiricahua Mts., White Tail Canyon. Male holotype, taken by H. A. Pilsbry and S. H. Ferris in 1906. [Academy of Natural Sciences of Philadelphia, Type no. 9973.]

Paradise Canyon, a second male taken in 1906 by the same collectors.

***Arinolus zacatecus* new species**

Figs. 59 and 60.

Color black, with narrow light-colored annuli about the borders of the metazonites. Legs dusky ferruginous. Antennae nearly black.

Clypeal foveolae 5 + 5.

Collum strongly narrowed down the sides, with lower end angular; anterior border set off by a sulcus which extends up to the level of the eye.

Segmental sulcus clearly impressed throughout its length. The spore lying on the line of the sulcus which is somewhat angled at its level. Under the microscope there are shown characteristic longitudinal lines or rugae which are better developed on the prozonites than on the metazonites.

Last tergite convexly rounded behind; exceeded by the valves. Anal valves inflated as usual, meeting in a deep and moderately wide median channel.

In the male the coxal processes of the third legs differ from those of other known species in being much more prolonged, cylindrical instead of lamellate, sclerotized and distally curving caudad over the processes of the two following pairs of legs. Processes of fourth to seventh coxae inclusive lamellate, with those of the seventh legs somewhat larger and thicker than those of the two preceding pairs.

Gonopods of the male as represented in figs. 59 and 60.

Number of segments, 43.

Width, 3.5 mm.

Like *A. torynophor* in the clypeal foveolae but differing from this and related species in the details of the male gonopods.

Locality.—Mexico: Zacatecas, Temperoso del Oro Mts. One male, holotype, taken in 1934. [Academy of Natural Sciences of Philadelphia, Type no. 9974.]

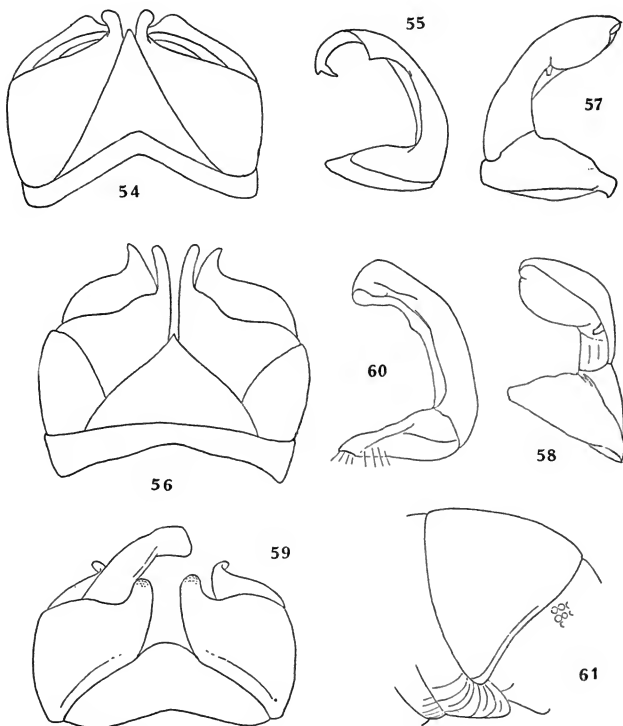


FIG. 54.—*Onychelus jaegeri* n. sp. Anterior gonopods, cephalic aspect. FIG. 55.—The same. Left posterior gonopod, caudal view. FIG. 56.—*Arinolus chiricahuanus* n. sp. Anterior gonopods, anterior view. FIG. 57.—The same. Right posterior gonopod, caudal aspect. FIG. 58.—The same. Right posterior gonopod in mesocephalic aspect. FIG. 59.—*Arinolus zacatecus* n. sp. Gonopods of male, with right posterior member removed, seen from in front. FIG. 60.—The same. Left posterior gonopod, anterior view. FIG. 61.—*Hiltonius conservatus* n. sp. Collum and adjacent parts from right side.

Hiltonius conservatus new species

Figs. 61-63.

After long preservation the type of this species is brown, with lighter, nearly chestnut annuli about caudal borders of the segments. The legs are yellow.

The collum and lower part of second segment are of the form and relations shown in fig. 61.

On the following tergites the sulci are distinct up to level of pores but not across dorsum. Metazonite roughened above with two or three series of low but distinct elongate tubercles or short ridges.

Last tergite widely rounded behind, smooth, exceeded by the anal valves. Anal valves evenly inflated, their mesal borders reentrant as usual.

In the male the first two legs and their claws enlarged, the third legs intermediate. Coxae of third legs with lamellate processes, the fourth to seventh legs with processes slight.

The features of the gonopods of the male are as shown in figs. 62 and 63.

Number of segments, 45.

Diameter of male holotype, 5 mm.

Locality.—California: Ft. Tejon. One male, holotype. [Academy of Natural Sciences of Philadelphia, Type no. 9975.]

This species suggests *H. mimus* but is distinct, e.g. in the details of the posterior gonopods. Thus, in the distal portion of the telopodite the anterior rim bears a subapical spur as shown in the figure, whereas in *mimus* a similar process is on the posterior rim.

Messicobolus pilsbryi new species

Figs. 64 and 65.

While evidencing probably close relationship to *M. hoogstracli*, a species also occurring in Nuevo Leon, the present form seems readily distinguishable in its smaller size and different color pattern. While in *hoogstracli* the segments are chestnut with a relatively narrow darker annulus over posterior part of the metazonites, in *pilsbryi* the color is nearly solid black excepting a narrow caudal ring of reddish color bordering the metazonite of the segments. The legs are somewhat chestnut colored.

In the male there are the usual sub-lamellate, distally pointed, processes from the coxae of the third to seventh legs inclusive. These processes of the third legs are smaller than those of the fourth legs.

The features of the gonopods are represented in figs. 64 and 65.

Number of segments in the male holotype, 44.

Width, 8.5 mm.

Locality.—Mexico: Nuevo Leon, Pabillo. One male, holotype, taken by Dr. H. A. Pilsbry in June 27, 1934. The elevation of the locality is 8,200 ft. [Academy of Natural Sciences of Philadelphia, Type no. 9976.]

SPIROSTREPTIDAE**Orthoporus pontis** new species

Fig. 66.

A light brown species with annuli a darker brown and much less sharply defined than the black annuli in *O. texensis*. Legs brown.

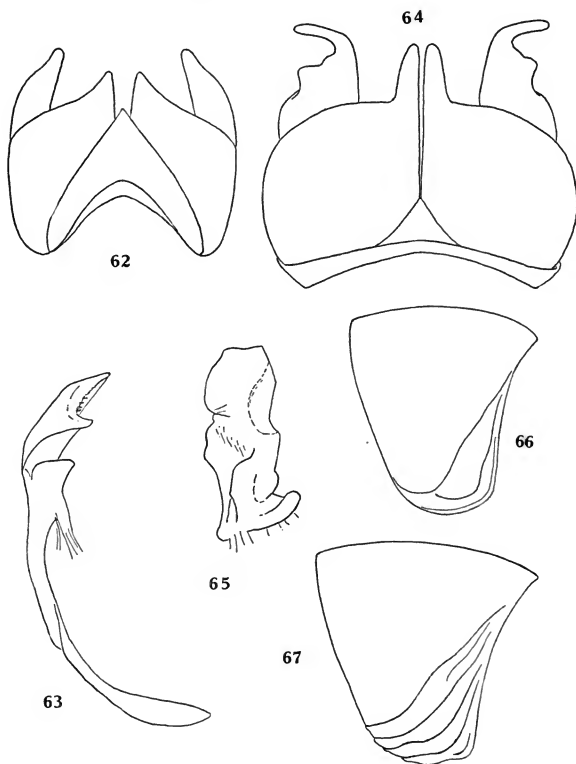


FIG. 62.—*Hiltonius conservatus* n. sp. Anterior gonopods, cephalic aspect. FIG. 63.—The same. Left posterior gonopod, anterior view. FIG. 64.—*Messicobolus pilsbryi* n. sp. Anterior gonopods cephalic aspect. FIG. 65.—The same. Left posterior gonopod, caudal aspect. FIG. 66.—*Orthoporus pontis* n. sp. Collum from right side. FIG. 67.—*Orthoporus tezensis* Chamberlin. Collum from the right side.

In comparison with *texensis* a relatively more robust form in which the segmental sulcus and the longitudinal striae are finer and much more lightly impressed. The repugnatorial pores are farther from the sulcus and the latter is less excurved opposite the pore.

The collum and its striae are typically as shown in fig. 66, which may be compared with the figure of the collum of *texensis* (fig. 67). The striae in *texensis* are coarser and more sharply impressed, with the bordering elevation ventrad of each raised as a distinct ridge, a feature not evident in the present species.

Number of segments, 70.

Width, 7 mm.

Locality.—Texas: High Bridge, on Pecos River. Three females. [Academy of Natural Sciences of Philadelphia, Type no. 9977.]

Orthoporus sanctus new species

Fig. 68.

Body grayish yellow to yellow with sharply marked annuli from dark brown to black, these broad above and narrowing down the sides. Anal segment black or nearly so as are also the collum and upper part of head. Legs brown.

Head smooth. Acute inner ends of eyes something over once and a half the length of the eyes apart; upper side of eye convex, the lower somewhat concave.

Collum with characteristic striae as shown in fig. 68.

On most segments the striae over the metazonite beneath are fine and close-set, not as strongly impressed as usual, obsolete above. Pore about one third distance from sulcus to caudal margin.

Last tergite with a low, rounded elevation or ridge running transversely at about the middle. Tergite exceeded by the anal valves; on these the compressed mesal part not sharply defined as in the preceding species.

Number of segments, 75.

Diameter, 6.8 mm.

A slightly smaller form than *O. pontis* Chamberlin with segments somewhat more numerous and with the striae of the collum differing as shown in the figures.

Locality.—Florida: St. Augustine. One female. [Academy of Natural Sciences of Philadelphia, Type no. 9978.]

Orthoporus boreus new species

Fig. 69.

General color light brown with darker brown annuli edged with chestnut about caudal borders of tergites. Legs dark brown.

Head smooth and shining. Eyes narrowly subtriangular with the apices mesad, separated by nearly twice their transverse length.

Collum of shape and with sulci as shown in fig. 69.

Tergites smooth above; lateral striae not strong below, the upper ones abbreviated, the series not reaching to level of the pore. Repugnatorial pore located at one third or more the distance from sulcus to caudal margin.

Anal tergite with the broadly triangular caudal portion set off by a transverse furrow. Anal valves exceeding the tergite, mesally strongly compressed and elevated as usual.

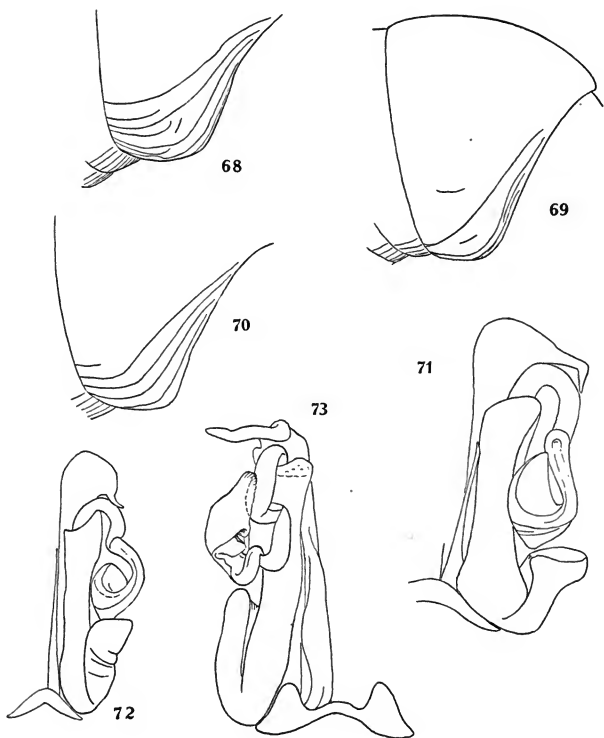


FIG. 68.—*Orthoporus sanctus* n. sp. Lower end of collum from right side. FIG. 69.—*Orthoporus boreus* n. sp. Collum from right side. FIG. 70.—*Orthoporus acanthethus* n. sp. Collum from right side. FIG. 71.—The same. Gonopods of right side, anterior view. FIG. 72.—*Orthoporus hoctunicolens* Chamberlin. Right gonopods, anterior view. FIG. 73.—*Orthoporus zulu* n. sp. Left. gonopods, anterior view.

Number of segments, 68.

Diameter, 7 mm.

Differing from *O. entomacis* Chamberlin, of Arizona in the form and striation of the collum.

Locality.—Idaho: Snake River Desert, Tobor. One female, holotype, Oct. 11, 1928. [Academy of Natural Sciences of Philadelphia, Type no. 9979.]

This is the first record of a member of the Spirostreptidae occurring in America north of Arizona.

***Orthoporus acanthethus* new species**

Figs. 70 and 71.

Strongly marked annuli of bluish color embracing posterior part of metazonites and caudal border of prozonites, the caudal border of metazonites yellow or yellowish white down the sides and ferruginous across dorsum. Caudal segment clear yellow. Legs ferruginous. Head bluish over vertex and frons, the lower portion yellowish.

Eyes relatively large, separated by but little more than their length; anterior margin straight, the remaining margin forming a convex curve. Ocelli in 6 series, e.g., 9, 9, 7, 6, 5, 3.

Collum with lower ends having form and striae as shown in fig. 70.

Segmental sulci strongly impressed throughout. Metazonites laterally and densely punctate, the punctae characteristically crowded, mostly separated by only narrow borders. Longitudinal striae strongly impressed beneath, the series not extending to the pores.

Last tergite long but not exceeded by the valves; posteriorly subtriangular but with median portion rounded; upper surface lacking striae or furrows, even except for the numerous punctae.

The gonopods of the male present distinctive features as shown in fig. 71.

In some of the anterior legs of the male (e.g. the third, fourth and fifth pairs) the penult and antepenult joints at their distal end beneath present lappets projecting distad beneath the succeeding article.

Number of segments, 55.

Width, 4 mm.

Locality.—Guatemala: Piedras Negras. June 30, 1933. One male, holotype, taken by D. W. Amram. [Academy of Natural Sciences of Philadelphia, Type no. 9980.]

***Orthoporus hoctunicolens* Chamberlin**

Fig. 72.

YUCATAN: A male and female.

This species was based originally upon a female taken at the mouth of Hoctun Cave, near Tixcacal, Yucatan. The specimens of the present lot are somewhat lighter in color than the type specimen. Inasmuch as the male has not heretofore been recorded, a figure of the gonopod is given. In the male the collum is not specially produced below or otherwise modified. The number of segments is 64-65.

Orthoporus nitidus (Daday)

WEST INDIES: Trinidad. One male taken by Prof. Benjamin Sharp.

This is a strongly marked and well-named species originally described from this island and previously reported by the present writer from near Port of Spain.

Orthoporus zulu new species

Fig. 73.

Segments nearly black posteriorly but changing to chestnut anteriorly. Head blackish above with frontal and clypeal areas reddish yellow or light orange. The anal segment also light orange. Legs yellow of slightly reddish tinge.

Inner angle of eye extending much mesad of inner margin of antennal socket, the eyes being separated by less than their transverse length. Inter-ocular sulcus absent and longitudinal sulcus obscure.

Antero-inferior corner of collum conspicuously produced, rounded. In addition to the submarginal sulcus four sulci subparallel to it down the anterior border and curving caudad to the posterior margin.

Encircling striae of prozonites numerous, more widely separated toward the metazonite. Metazonites marked above with low, longitudinal rugae, otherwise smooth and shining.

Anal tergite obtusely angled behind. Marginal thickening of the anal valves high. Anal scale broadly triangular.

Gonopods of the general structure of *G. pontifex* Attems. The sternite is similarly a low transverse plate but with the lateral ends much more protruding ventrad. The laterally turned lappet of the coxite more elongated and much less elevated lateral. See for further details fig. 73.

Number of segments, 46.

Diameter, 6.5 mm.

Locality.—South Africa: "Zulu Land."¹ One male, holotype, taken by Rev. A. Grout. [Academy of Natural Sciences of Philadelphia, Type no. 9981.]

CAMBALIDAE**Cambala annulata** (Say)

TENNESSEE: Cumberland Mts., on Holston River. Several specimens collected by E. D. Cope.

¹ This material was taken many years ago at an old mission station, which was near the present site of Umvoti, Natal. (J.A.G.R.)

AFRICAN AND MALAGASY BLATTIDAE (ORTHOPTERA). PART IV.

BY JAMES A. G. REHN

Curator of Insects, Academy of Natural Sciences of Philadelphia

In the prefatory remarks to Part I of these studies¹ there was presented a brief discussion of their background and character, and amplifications of the same will be found in the other parts of the series which have so far appeared.² The present study of the genus *Supella* is offered in advance of the completion of other sections of this series, which it had been intended to include in the present part. The delayed sections require the preparation of essential illustrations and of detailed descriptions, on the completion of which a number of critical studies will be ready for publication.

PSEUDOMOPINAE

A Revision of the African Species of the Genus Supella

This study was largely completed some years past, but along with other elements of these contributions was of necessity laid aside during the uncertainty of the past six years. In several respects, however, this has been advantageous, as certain new information aided in rounding out conclusions here presented. As all the known species of *Supella* occur within the area covered by this set of studies, that is at this writing a virtual revision of the genus, but extra-limital information has merely been summarized and not set forth in the same detail as that from Africa.

The present study deals with six species of three subgenera of the genus, of which three species and two subgenera are here described as new. It is based on 122 African specimens of *Supella*, representing all the forms here placed in the genus. In addition to material in the collection of the Academy, representations here reported are from the series of the British Museum (Natural History), French National Museum of Natural History, (i.e. here referred to as the Paris Museum), the Museum of the Belgian Congo, the Geneva Museum, the Transvaal Museum, the South African Museum, the Albany Museum at Grahamstown, South Africa, the Vienna Zoological Museum, the Berlin Zoological Museum, the Carnegie Museum, and the Museum of Comparative Zoölogy. As is customary, duplicate material from these series has been placed in the Academy collection.

¹ Proc. Acad. Nat. Sci. Phila., LXXXIII, pp. 305-387, pls. 31-35, (1931).

² Part II; Proc. Acad. Nat. Sci. Phila., LXXXIV, pp. 405-511, pls. 30-33, (1933); Part III; Idem., LXXXIX, pp. 17-123, pls. 8-11, (1937).

SUPELLA Shelford

1839. *Blatta* Serville, Hist. Nat. Ins., Orthopt., p. 114. (In part.)
1839. *Phyllodromia* Serville, Hist. Nat. Ins., Orthopt., p. 105. (In part.)
1868. *Ischnoptera* Walker, Catal. Blatt. Brit. Mus., p. 121. (In part.)
1911. *Supella* Shelford, Entom. Month. Mag., (2) XXII, p. 155.

Genotype (by original designation).—*Blatta supellectilium* Serville.

Shelford erected the genus *Supella* in the first serious attempt ever made to resolve into natural assemblages the unrelated mass of species which had been dumped by previous authors into the blanket genus *Phyllodromia*. The genotypic species has become in recent decades, one of the most widely spread tropical and subtropical domiciliary species of cockroaches, apparently very largely through human agencies.

Generic Characters.—Sexes moderately dissimilar, but alar organs present in both sexes. Head variously pyriform in outline in cephalic aspect; eyes well separated at occiput in both sexes; frons obliquely deplanate, with a distinct transverse elevation of varying outline separating its surface from that of the face; palpi elongate, ultimate article shorter than penultimate, the latter basically infundibuliform. Pronotum ovate subtrapezoidal in outline. Tegmina of male lanceolate, surpassing the adominal apex by at least the pronotal length; costal veins numerous, straight oblique, several of the more distal ones usually ramose; discoidal sectors oblique, tending toward sublongitudinal in the males of *abbotti* and *mirabilis*; anal field pyriform, anal veins five or more, regular: tegmina of female varying in length from covering but half the abdomen (certain individuals of *hottentotta*) to surpassing the abdominal apex by a distance equal to the pronotal length, in outline ranging from 1.5 times as long as broad, with disto-sutural portion of costal margin broadly arcuate to a subacute disto-sutural apex, to a broad lanceolate type definitely over twice as long as broad, with a well-rounded apex; costal veins as in males, reduced in number in the abbreviated tegmined forms, discoidal sectors similarly developed, anal field always fully indicated. Wings fully developed in all but those females of *hottentotta* with greatly reduced tegmina, and in which the wings are virtually rudimentary and functionless; costal veins in males slightly thickened oblique, some bifurcate or ramose, ulnar vein with from three to six rami, slight intercalated area present in the male sex. Dorsal surface of abdomen of male with (*Supella* s. s. and subgenus *Mombuttia*) or without (subgenus *Nemosupella*) a specialized glandular area on the seventh tergite, dorsum of female abdomen lacking any specialized structure; supra-anal plate of male transverse trigonal, cerci of male elongate, tapering, subgenital plate of male subtrigonal in outline in ventral aspect, apex narrowly and briefly fissate, with the resultant paired apical lobes attingent, styles of male subgenital plate ranging from symmetrical to appreciably asymmetrical, from simple and subfalciform with apices blunt acute, through subinflated and corniform with aciculate apices to outcurved bluntly acute appendages. Cephalic femora with ventro-cephalic margin bearing a regular series of spines, evenly reducing in length and strength distad,³ apical spines of same margin two in

³ Rarely in *S. (N.) mirabilis* three or four of the more distal spines of this species are lacking or are replaced by setae, but this is apparently a purely adventitious condition and is sometimes found only in one limb.

number,⁴ the terminal one much the longer; median and caudal femora with ventral margins spined; caudal tarsi with metatarsus in length surpassing the other articles combined; arolia well developed; tarsal claws of equal length, their margins unarmed, simple.

Distribution.—The domiciliary *S. supellectilium* is virtually circumtropical in its present distribution, and in addition it is now established in numerous areas in temperate North America, as well as in certain subtropical ones, as Egypt, Arabia, Palestine and Cyprus. It has also been taken as an adventive in Paris, France.⁵ It was clearly African in origin and on the accompanying distributional map I have plotted the localities on that continent from which I have seen the species, or from past records which seem beyond question to refer to that form. The other species here referred to the genus *Supella* are all African or Malagasy in distribution, and range from the Gold Coast and Angola to Eritrea and eastern Cape Province, with no records available from western Cape Province or Southwest Africa. Undoubtedly semi-feral *supellectilium* is widely distributed in suitable areas over the Sahara in addition to those points indicated on the map. Mauritius, Madagascar and the Amirantes group in the Indian Ocean are also included in the range of the genus. It is perhaps more than a coincidence that most of the area in southwestern Africa from which we have no records of endemic *Supella*, is included in the range of *Namablatta*,⁶ which is the nearest known relative of *Supella*. Whether the two genera have complementary ranges is for the future to determine.

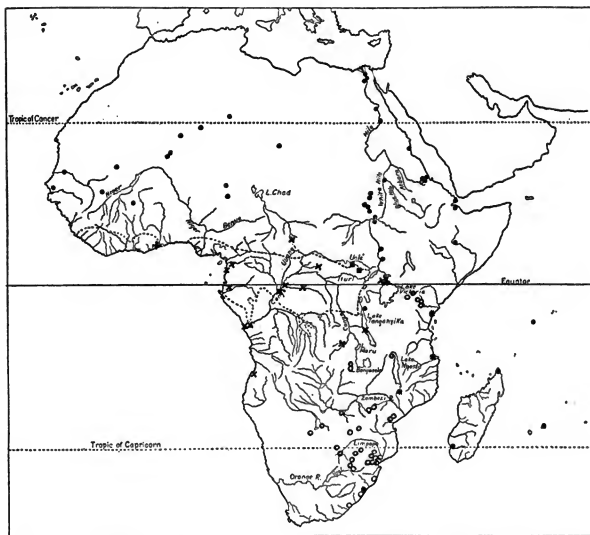
Relationship.—As stated by me in 1937, when describing the genus *Namablatta* of southwestern Africa, that genus and *Supella* are close relatives,⁷ and probably have had a common ancestry. While *Namablatta* is limited in distribution to portions of the Bechuanaland Protectorate, Southwest Africa and the more arid sections of the Cape Province, *Supella*, on the other hand, is widely distributed over Africa, with one species now a circumtropical domiciliary pest. The general form of the males of *Supella* and *Namablatta* is relatively similar, but the females are more different in appearance. The basic pattern of the male genitalia is similar in the two genera and the general relationship of the subgenera *Supella* and *Mombuttia* to *Namablatta* is closer than is that of the subgenus *Nemosupella* to the genus *Namablatta*. In consequence I would place *Namablatta* immediately preceding the genus *Supella*.

⁴ Rarely in *S. (N.) mirabilis* three such spines are clearly present, a third shorter and more proximal but clearly inclusive major spine being evident. However, this also seems to be an adventitious condition and without other significance, although the regular presence of three such spines is a character possessed by certain other genera.

⁵ See Chopard, Ann. Soc. Entom. France, CII, p. 172, (1933).

⁶ See Rehn, Proc. Acad. Nat. Sci. Phila., LXXXIX, pp. 18-19, (1937).

⁷ Proc. Acad. Nat. Sci. Phila., LXXXIX, pp. 17-18, (1937).



Map 1.—Distribution of the species of the genus *Supella* in Africa, Madagascar and the Mascarene Islands, on the basis of material here studied or of authentic records. Localities for *S. supellectilium* indicated by solid dots, *hottentotta* by circles, *abbotti* by asterisks, *chapini* by solid squares, *mirabilis* by oblique crosses, and *gemma* by horizontal crosses.

The approximate areas of the two West African Forest areas are enclosed by dotted lines.

The main feature distinguishing *Supella* and *Namablatta* is the type of armament of the ventro-cephalic margin of the cephalic femora. In *Supella* this is of Type A, i.e. consisting of regularly placed and robust spines decreasing in length and size distad, while in *Namablatta* the same series is of Type B, in which except for the distal (apical) group and a proximal one, the armament is regularly piliform. In addition there are certain other features of distinction, including the much more strongly demarcated frons in *Supella*, and the attingent and non-truncate tegmina in the females of the same genus.

Superficially certain members of the very different group *Baltae*⁸ (Maretae of authors) of the subfamily Ectobiinae greatly resemble *Supella*, but the very distinctive type of male genitalia, particularly the characteristic structure of the subgenital plate, at once distinguishes them from *Supella* and many other genera. In addition numerous other distinguishing features are possessed by members of the group *Baltae*, a study of the African members of which I now have in large part completed.

Subgenera.—The genus is divisible into three well-marked subgenera on the following features:

1. Male sex lacking a specialized area on dorsum of seventh abdominal tergite. Styles of subgenital plate of male not depressed, not subfalcate inward, but either tapering, strongly corniform and aciculate acute, or subcompressed, recurved laterad, and blunt acute at apices *Nemosupella* new subgenus
Male sex with specialized area on dorsum of seventh abdominal tergite. Styles of subgenital plate of male relatively simple, depressed, subfalcate inward, with apices more or less definitely rounded.⁹ 2
2. Palpi less elongate, penultimate and antepenultimate articles shorter, not over 1.3 and antepenultimate 1.25 times as long as ultimate article. Tarsi with metatarsus longer than remaining tarsal articles only in caudal limbs, and there but slightly so. Subgenital plate of male with fission in distal section when evident very short and less decided *Supella* s. s.
- Palpi exceptionally elongate, with penultimate and antepenultimate articles very long, the former in male sex more than 1.5 and the antepenultimate over 1.3 times the length of the ultimate article. Tarsi with metatarsus of all limbs slightly to distinctly longer than all other tarsal articles combined, that of caudal tarsi constituting three-fifths of total tarsal length. Subgenital plate of male with its distal section deeply and narrowly fissate *Mombuttia* new subgenus

SUPELLA sensu strictiore

The basic characters which distinguish the restricted subgenus *Supella* from the West and Central African subgenera *Mombuttia* and *Nemosupella* have been given in the subgeneric key above. The species *abbotti* is to a certain degree an annectant form, but in the bulk of its features it is a true *Supella*, and is so included here.

The species which make up this subgenus appear to be more adaptable than those of *Mombuttia* and *Nemosupella*, and a domiciliary type of habitat is found in true *Supella* but not in the other subgenera here discussed.

⁸ See Hebard, Monogr. Acad. Nat. Sci. Phila., no. 4, p. 36, (1943). This paper includes a comprehensive study of the Australian members of that group.

⁹ The styles of the subgenital plate are less typical of the subgenus *Supella* in the species *abbotti* than in the other forms there included, but in all other respects that species must be considered a true *Supella*.

Key to the African Species of *Supella* s. s.

Males

1. Size smaller. Head proportionately narrower (breadth in length averaging 1.19 times), more tear-shaped; interspace between eyes averaging broader, definitely much greater than half of eye depth at same point. Pronotum proportionately narrower, length averaging over three-fourths of greatest breadth, lateral areas of pronotum narrower. (Form elongate, tegmina relatively narrow.) (Circumtropical, endemic in Africa.) *supellectilum* (Serville)
- Size larger. Head proportionately broader (breadth in length averaging 1.13 times), more cordiform; interspace between eyes averaging narrower, definitely not more than half of eye depth at same point. Pronotum proportionately broader, length averaging but seven-tenths of greatest breadth, lateral areas of pronotum broader 2
2. Tegmina narrower, greatest breadth contained over 1.6 times in their length; marginal field relatively narrow. Limbs as a whole more slender, femora, particularly median and caudal pairs, relatively thin. Cerci proximad more narrowed proportionately. Styles of subgenital plate with apices bluntly rounded (as in *S. supellectilum*), not acute, not upcurved distad. (Pronotum with, or rarely without, a pale median spot in the otherwise dark disk, this of variable shape, even being sagittiform occasionally. Venation in darker areas of tegmina never pale pencilled.) (South and East Africa.) *hottentotta* (Saussure)
- Tegmina broader, greatest breadth contained less than 1.5 times in their length; marginal field relatively broad. Limbs as a whole more robust, femora, particularly median and caudal pairs, deeper and stouter. Cerci proximad broader proportionately. Styles of subgenital plate with apices subspiniform acute, upcurved distad. (Pronotum [in available series] with a sagittiform pale marking caudad in the otherwise dark disk. Venation in certain of the darker areas of tegmina often pale pencilled.) (Coastal Kenya Colony to Nyasaland.) *abbotti* new species

Females

1. Form markedly different from that of male, short, stout; alar organs little if any surpassing apex of abdomen. Interspace between eyes broad, in width usually distinctly more, rarely slightly less, than depth of eye at same point. Marginal field of tegmina relatively narrow 2
- Form little different from that of male except for greater robustness; alar organs surpassing the apex of the abdomen by a distance at least as great as the length of the pronotum. Interspace between eyes narrow, in width not equalling half the depth of eye at same point. Marginal field of tegmina broad. (Pronotum [in available series] with a sagittiform pale marking caudad in the otherwise dark disk. Venation in certain of the darker areas of tegmina pale pencilled.) (Coastal Kenya Colony to Nyasaland.) *abbotti* new species
2. Pronotum with pale lateral borders proportionately narrower when same are clearly indicated, dark disk but infrequently with pale center. Tegmina usually reaching practically to apex of abdomen, always at least twice as long as pronotum. Cerci proportionately stouter. Color pattern may or may not be strongly contrasted. (Circumtropical, endemic in Africa.) *supellectilum* (Serville)
- Pronotum with pale lateral borders proportionately broader, dark disk usually with pale center. Tegmina quite variable in length, sometimes hardly longer than the pronotum. Cerci proportionately more slender. Color pattern always strongly contrasted. (South and East Africa.) *hottentotta* (Saussure)

I am quite unable to say whether Ignacio Bolivar's *Supella amoena*¹⁰ is a member of the restricted subgenus *Supella* or even of the genus itself,

¹⁰ Ann. and Mag. Nat. Hist. (9), XIII, p. 337, (1924). [♂, ♀; Desroches Island, Amirantes.]

or to suggest with any degree of assurance exactly where it may eventually be assigned. The species is known only from the Amirantes group in the Indian Ocean, and while the original description is quite extensive it stresses almost solely characters of color, and fails to mention really important structural features. On a subsequent page I am presenting a few additional comments on *amoena*, which as far as the present information is concerned must await future study.

Supella (Supella) supellectilium (Serville) Text-figs. 1-8; plate I, fig. 33.

1839. *Blatta supellectilium* Serville, Hist. Nat. Ins. Orth., p. 114. [♂, ♀; Île de France (= Mauritius).]

1868. *Blatta incisa* Walker, Catal. Blatt. Brit. Mus., p. 109. [♂, ♀?; St. Domingo (♂), Mauritius (♀?).]

1868. *Ischnoptera quadriplaga* Walker, Catal. Blatt. Brit. Mus., p. 121. [♂; Mauritius.]

1868. *Blatta extenuata* Walker, Catal. Blatt. Brit. Mus., p. 221. [♂; Egypt.]

Synonymy.—Numerous other names, based on material from other areas, as the West Indies and India, are known to be synonyms of the widely spread *supellectilium*, but as these do not bear upon its occurrence in the Ethiopian, Malagasy or Mascarene areas they are not given here. The rather decided sexual dimorphism of this and related species, and the range in depth of color pattern, are factors which contributed toward this synonymy, most of which came from Walker's pen.

Material of *S. hottentotta* (Saussure), as here understood, was confused with *supellectilium* by me in 1922,¹¹ largely on account of Shelford's synonymy¹² under *supellectilium* of Kirby's *Phyllodromia delta*, which was based on the male sex of *hottentotta*. Kirby in 1904, presumably with the type material of Walker's *Blatta incisa* and *Ischnoptera quadriplaga* before him, established¹³ the synonymy of these names under *supellectilium*. Shelford, in 1907, from an examination of the type of Walker's *Blatta extenuata* placed it¹⁴ as another synonym of Serville's species.

Type Material.—Dr. Chopard advises me (in litt.) that the original material of *supellectilium* has been lost.

General features.—In the past literature will be found figures and descriptions presenting the general characteristics of *S. supellectilium*. Back, in 1937,¹⁵ gave drawings of both sexes and photographs of the immature condition and of the oötheca; Chopard in 1943¹⁶ presented descriptions of

¹¹ Ann. Transv. Mus., IX, p. 18.

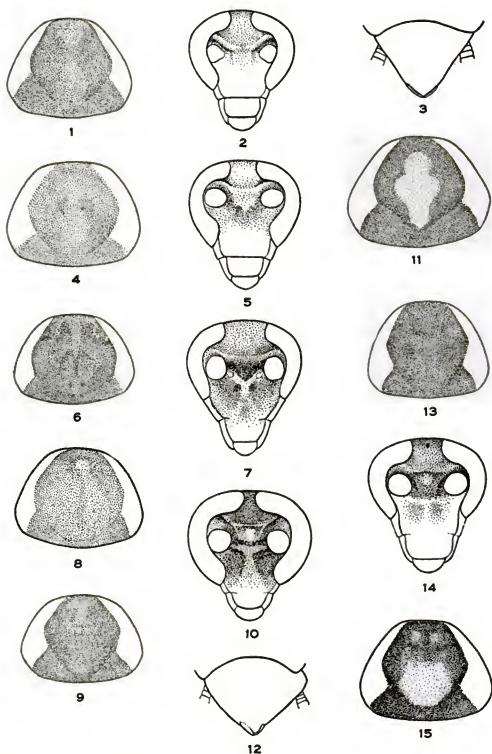
¹² Genera Insectorum, fasc. 55, Orthoptera, Phyllodromiinae, p. 11, (1908).

¹³ Synon. Cat. Orth., I, p. 88.

¹⁴ Trans. Entom. Soc. London, 1907, p. 494.

¹⁵ Proc. Entom. Soc. Wash., XXXIX, pp. 206, 207 and 211, figs. 1 & 2, pl. 19, lower half.

¹⁶ Faune Empire Française, I, p. 38, fig. 34.



Supella supellectilium (Serville). Male; Kaoleck, Senegal. Fig. 1.—Pronotum (much enlarged). Fig. 2.—Cephalic view of head (much enlarged). Fig. 3.—Subgenital plate in ventral aspect (greatly enlarged). Male; Entebbe, Uganda. Fig. 4.—Pronotum (much enlarged). Fig. 5.—Cephalic view of head (much enlarged). Female; Kampala, Uganda. Fig. 6.—Pronotum (much enlarged). Fig. 7.—Cephalic view of head (much enlarged). Female; Oahu, Hawaii. Fig. 8.—Pronotum (much enlarged). *Supella hottentotta* (Saussure). Male; Athi River Crossing, Kenya Colony. Fig. 9.—Pronotum (much enlarged). Fig. 10.—Cephalic view of head (much enlarged). Male; Magude, Transvaal. Fig. 11.—Pronotum (much enlarged). Fig. 12.—Subgenital plate in ventral aspect (greatly enlarged). Female; Athi River Crossing, Kenya Colony. Fig. 13.—Pronotum (much enlarged). Fig. 14.—Cephalic view of head (much enlarged). Female; Kibwezi, Kenya Colony. Fig. 15.—Pronotum (much enlarged).

both sexes and an excellent figure of the female, and in 1945 in a photograph of the sexes side by side I brought out the rather marked difference between the two.¹⁷ In 1917 Hebard gave a detailed description of the structural features of both sexes of *supellectilium*, pointed out the species' broad range in color pattern emphasis, and figured¹⁸ the gland development of the male abdomen and the tegminal and pronotal pattern of a strongly marked male.

The sole known species of the genus *Supella* with which *supellectilium* is liable to be confused, as it has been in the past, is *hottentotta* (Saussure). The key to the species given on a preceding page, and the comments under *hottentotta*, should make evident the differences between the two.

Variation.—In size there is a fair amount of variation in African material of both sexes of *supellectilium*, as the following measurements (in millimeters) demonstrate.

	Length of body	Length of pro- notum	Breadth of pro- notum	Length of tegmen	Breadth of tegmen
♂, Kaolack, Senegal	11.2	2.5	3.4	10.9	2.9
♂, Podor, Senegal	10.6	2.7	3.9	11.9	3.2
♂, Cairo, Egypt	19	3.4	4.0	13.2	3.5
♂, Entebbe, Uganda	11.0	2.7	3.7	12.2	3.5
♂, Durban, Natal	10.6	2.6	3.8	11.9	3.5
♀, Pawa, Nigeria	12.0	3.7	4.7	8.6	3.4
♀, Dundass, Niger	11.7	3.4	4.4	8.9	3.5
♀, Cairo, Egypt	11.2	3.5	4.4	9.9	3.4
♀, Kampala, Uganda	12.3	3.2	4.3	8.1	3.4
♀, Region of Sakarami, Madagascar	10.2	3.2	4.4	7.9	3.2

The range in emphasis and tone of color pattern in both sexes has already been pointed out by Hebard²⁰ and Back²¹ and need not be discussed here. Not enough material from any single African locality is available to indicate whether there is any appreciable regional correlation of color pattern intensity. It can be said, however, that most of the recessively patterned individuals of both sexes are from arid or semi-arid regions (i.e. Cairo, Khartoum and the Blue Nile), although almost equally pale are the single males from Entebbe, Uganda and Durban, Natal, which however, conceivable may represent stock recently derived from much more arid sections to the northward. On the other hand the female from Kampala, Uganda, but a relatively few miles from Entebbe, is one of the most intensively colored African specimens seen.

¹⁷ Scientific Monthly, LXI, p. 271, fig. 5.

¹⁸ Mem. Amer. Entom. Soc., II, pp. 47-49, pl. 1, figs. 24-27.

¹⁹ Apex of abdomen damaged.

²⁰ Mem. Amer. Entom. Soc., II, pp. 47-49, (1917).

²¹ Proc. Entom. Soc. Wash., XXXIX, p. 208, (1937).

Distribution.—The species *Supella supellectilium* is now one of the widely spread domiciliary blattids,²² known to occur over a considerable part of the tropics and subtropics of the Old World, in most of the West Indies and a steadily expanding section of the southern and eastern United States and also at a number of coastal and nearby points in South and Central America. It has been recorded recently by Chopard as an adventive in France.²³

In 1922²⁴ following Shelford's 1908 synonymy of Kirby's *Phyllodromia delta*²⁵ I confused the species here recognized as *hottentotta* with *supellectilium*, which others also have done. In consequence it is virtually impossible to determine from the literature alone whether records of *supellectilium* really relate to that species or to others here recognized. While there are in the neighborhood of sixty African records reportedly of *supellectilium*, whether more than a portion of these actually relate to that species can be determined only by re-examination of the material. This is particularly true of records from areas in which we now know other species of the genus occur. In consequence, in mapping the distribution of the species of the genus, I am under the necessity of disregarding a number of the past African records unless I have the material before me, or at least representatives of *supellectilium* from the same locality. From general areas in which no other form related to *supellectilium* occurs, the correctness of the determination has been assumed.

In Africa *supellectilium* so far seems to be absent from coastal north-western Africa, a rather peculiar condition when its tendency to be spread by commerce is so marked elsewhere. Chopard, writing on this in 1943,²⁶ intimated that he expected it to be found any day in the cities of that area. It is rather generally distributed in the Nile Valley of Egypt, north to Cairo, along the Red Sea littoral and inland as far as Gura and Cheren, Eritrea, in the Anglo-Egyptian Sudan across Kordofan and up the White Nile, reaching its known southern limits in the eastern interior in Uganda (Entebbe and Kampala) and at the northern end of Lake Tanganyika (Usumbura). There is also before me a single specimen labelled "German East Africa", but from what part of the present Tanganyika Territory is not known. Westward it extends in a broad belt across the Sudan and certain areas (chiefly elevated) of the Sahara (Hoggar, Tassili, Tilemsi and Tibesti) to Senegal (Podor and Kaolack). It does not extend southward

²² See Rehn, in "Man's Uninvited Fellow Traveler—The Cockroach", Scientific Monthly, LXI, p. 271, fig. 5, (1945).

²³ Ann. Soc. Entom. France, CII, p. 172, (1933).

²⁴ Ann. Transv. Mus., IX., pp. 18-19.

²⁵ Genera Insect., Orth., Phyllodromiinae (fasc. 73), p. 11.

²⁶ Faune de l'Empire Français, I, p. 37.

into the forested area of West Africa as far as available exact information goes.²⁷ A single specimen from Durban, Natal, shows its presence in east coast ports, while in Madagascar, in Mauritius and the Amirantes it has probably been established by commerce, as in so many other parts of the world.

From the available evidence it would appear to me quite probable that *supellectilium* originally developed in the Sudanese area of Africa, spreading into Egypt and to the Red Sea coast in early days, and along long established caravan lines into the Saharan areas where it is now known to occur. Its transportation in slave-ships from the coast of Senegal and related areas to the West Indies was naturally simple, and certainly its present distribution in the United States came from the latter islands. From the east coast of Africa its establishment in Ceylon, Burma and India, where it occurs broadly, was a simple matter, and the steps from the latter country to Australia and thence on to the Fijis and Hawaiian Islands, where it now occurs, were merely matters of time.

Its absence from the forested areas of Africa and certainly much of the southern interior of the continent (see map) tends to support the view that it originated in north-central Africa. Its adaptability in many parts of the world would seem to indicate its absence from areas of Africa as due to non-endemism, and very probably not to its elimination from these by other factors.

African material examined: 22; 10 ♂, 9 ♀, 3 juvs.

EGYPT: Cairo; VI-VIII; (E. Chakour); 1 ♂, 1 ♀; [A. N. S. P.].

ANGLO-EGYPTIAN SUDAN: Khartoum, Kordofan; III, 14, 1915; (A. Cottam); 1 ♂; [B. M. N. H.]. Blue Nile; (E. S. Crespin); 1 ♀; [B. M. N. H.].

ERITREA: Gura; 30 kiloms. south of Asmara; elev. 6400-6800 feet; VI-XII, 31, 1942; (J. W. H. Rehn); 1 juv.; [A. N. S. P.].

FRENCH SOMALILAND: Obock; 1893; (M. Maindron); 1 ♂; [Paris Mus.]. Djibouti; 1896; (Jousseume); 1 ♀; [Paris Mus.].

FRENCH WEST AFRICA, SENEGAL: Podor; VIII-IX, 1911; (R. Chudeau); 1 ♂, 1 juv.; [A. N. S. P.]. Kaolack; 1 ♂; [A. N. S. P.].

FRENCH WEST AFRICA, FRENCH SUDAN: Between Kayes and Bemako; VII-XI, 1910; (Mission Gironcourt); 1 ♂; [Paris Mus.].

FRENCH WEST AFRICA, NIGER: Dungass, Sultanate of Damagherim, region of Zinder; IX-X, 1910; (Mission Tilho; R. Gaillard); 1 ♂, 2 juvs.; [Paris Mus.].

²⁷ A single female labelled "Kamerun; Conrad", originally from the Deutsches National Entomologisches Museum, has been examined, but as it lacks exact locality I have not made use of it in mapping the distribution. If actually from the Cameroons it probably came from one of the ports of that area and was therefore an introduction. Without more detailed supporting information it seems best to regard this specimen as adventive.

FRENCH WEST AFRICA: IVORY COAST, Region of Lobi, 10° 50' N., 5° 30' W; 1906; (Lt. Greigert); 1 ♀; [A. N. S. P.].

NIGERIA: Pawa, Kogin Sirikin, Northern Provinces; XI, 1910; (J. W. Scott-Macfie); 1 ♀; [B. M. N. H.].

UGANDA PROTECTORATE: Entebbe; VI, 26, 1929; (C. R. S. Pitman); 1 ♂; [A. N. S. P.]. Kampala; I, 24, 1927; (H. Hargreaves); 1 ♀; [A. N. S. P.].

TANGANYIKA TERRITORY: ("German East Africa"); 1 ♀; [A. N. S. P.].

BELGIAN CONGO, URUNDI: Usumbura; I-II, 1926; (H. Schouteden); 2 ♂; [Mus. Belg. Congo and A. N. S. P.].

NATAL: Durban; (Bell-Morley); 1 ♂; [B. M. N. H.].

MADAGASCAR: Region of Sakarami; 1906; (Maurice de Rothschild); 1 ♀; [Paris Mus.]. Tulear, southwest Madagascar; I, 1904; (Voeltzkow); 1 ♂, 1 ♀; [A. N. S. P.].

Supella hottentotta (Saussure)

Text-figs. 9-15; plate 1, fig. 34.

1864. *Bl[atta] capensis* Saussure, Revue et Mag. de Zool., 2e ser., XVI, p. 310. [Sex probably ♂; South Africa.] (Not *Blatta capensis* Thunberg 1784.)

1899.²⁸ *Ceratinoptera hottentotta* Saussure, Abhandl. Senckenb. Naturf. Gesell., XXI, p. 575. [♀; South Africa.]

1899.²⁹ *Temnopteryx variegata* Schulthess-Schindler, Bull. Soc. Vaud. Sci. Nat., XXXV, p. 191, pl. 8, fig. 1. [♀; Delagoa Bay, Portuguese East Africa.]

1900. *Aphlebia transvaaliensis* Kirby, Ann. and Mag. Nat. Hist., (7) V, p. 278. [♀ (in error given as ♂); Pretoria [Transvaal].] (Type figured by Distant, Insect. Transv., I, pl. I, fig. 6, (1900).)

1900. *Phyllodromia delta* Kirby, Ann. and Mag. Nat. Hist., (7) V, p. 280. [♂ (sex not stated); Barberton [Transvaal].] (Type figured by Distant, Insect. Transv., I, pl. I, fig. 4, (1900).)

Synonymy.—Whether Saussure's 1864 *Blatta capensis* represents the same species as his later *Ceratinoptera hottentotta* remains to be determined. His type of *capensis* lacked the abdomen and he, therefore, did not give the sex, but from the tegminal length it is a male if a true *Supella*. Both Kirby³⁰ and Shelford³¹ considered Saussure's *capensis* to be a synonym of *supellectilium*, but this means little more than that they considered it related to, or as now interpreted congeneric with, that species. At any rate Saussure's 1864 *capensis* cannot be used, as the combination *Blatta capensis* was used eighty years earlier by Thunberg.

There can be no doubt as to the application of Saussure's 1899 *Ceratinoptera hottentotta* to this species. It was based on a female specimen, and the description fully agrees in its important features, with that sex of

²⁸ No exact date is given on the available copies. The part of the "Abhandlungen" was received in Philadelphia, from the Senckenburg Museum, August 22, 1899, and the actual publication date was clearly some months prior.

²⁹ Published June, 1899. Part received in Philadelphia, March 31, 1900.

³⁰ Synon. Catal. Orth., I, p. 88, (1904).

³¹ Genera Insect., Orth., Phyllodromiinae (fasc. 73), p. 11, (1908).

the species as here understood. It is presumed that the type of *hottentotta* is now in the collections of the Geneva Museum, along with other elements of the Saussure collection.

Schulthess-Schindler's *Temnopteryx variegata* was definitely erected on the present species, and topotypic material is now before me. Kirby's *Aphlebia transvaaliensis* and *Phyllodromia delta* were clearly erected on the female and male sexes respectively of this species. Distant's excellent figures show this beyond question. For some reason quite unknown Kirby considered the unique type of *transvaaliensis* to be a male, when it clearly is a female, and neglected to state the sex of *delta*, which just as obviously is a male.

In 1922 I confused this species with *supellectilium*,³² in this assignment following the synonymy of *delta* created earlier by Shelford, as shown above. All of the material specifically reported by me in 1922 as *supellectilium* is *hottentotta*. I am quite unable to say which species is represented by Karny's Rooibank, Walfisch Bay, S. W. Africa record of *supellectilium*, or that of Brancsik from the Region of the Baroma, Zambesi River, both of which records were given by me at that time in summarizing the distribution supposedly of *supellectilium*.

General features.—In appearance this species suggests the strongly patterned intensive extreme of *supellectilium*. In size, however, it averages larger, particularly in the male and especially in tegminal length. The shape of the head and the greater proportions of the interspace between the eyes, and the pronotal proportions, as presented in the preceding key to the species, will readily separate both sexes of *hottentotta* from *supellectilium*. The color pattern of *hottentotta* is much more pronounced than in any individuals of *supellectilium* except those of the most intensive pattern, and in no case have I seen material of this species so recessive in pattern tone that the dark elements are not fully evident. Recession in pattern in *hottentotta* is evident chiefly in the extent distad on the tegmina of dark markings and the scope of the dark elements on the pronotal disk. The tegmina of the females average shorter proportionately than in *S. supellectilium*, although this is much less evident in individuals from the northern portion of the range than it is in those from more southern localities.

Variation.—There is a considerable amount of individual variation in size in *hottentotta*, particularly in the male sex, as the figures (in millimeters) of extremes given below demonstrate. The lack of series of females from a single locality precludes in most cases the presentation of more than the measurements of single individuals.

³² Ann. Transv. Mus., IX, p. 18.

	Length of body	Length of pro- notum	Breadth of pro- notum	Length of tegmen	Breadth of tegmen
♂, Gura, Eritrea	15.1	3.	4.4	17.1	4.5
♂, Kiboko, Kenya	16.8	3.2	4.5	17.7	5.
♂, Athi River Crossing, Kenya	14.2	3.	4.3	15.3	4.4
♂, Guengere, Mozambique	12.3	2.7	4.	14.	4.
♂, Lourenço Marques, Mozambique	15.4	3.4	4.5	16.9	4.5
♂, Bulawayo, Southern Rhodesia	13.5	2.9	4.	16.1	4.4
♂, Kuke Pan, Bechuanaland Protectorate	12.5	2.6	3.7	14.3	4.
♂, Gaborones, Bechuanaland Protectorate	11.4 ³³	2.9	4.	15.1	4.2
♂, Grootdraai, Transvaal	14.6	3.	4.4	16.7	4.9
♂, Grootdraai, Transvaal	12.5	2.7	3.6	14.6	4.
♂, Pretoria, Transvaal	14.1	3.	4.	14.3	4.2
♂, Pretoria, Transvaal	14.5	3.	4.1	16.3	4.5
♂, St. Lucia Bay, Zululand	14.7	3.2	4.7	15.8	4.7
♀, Athi River Crossing, Kenya	12.3	3.	4.5	9.1	3.7
♀, Kibwezi, Kenya	12.5	3.5	4.7	9.2	3.6
♀, Delagoa Bay, Mozambique	12.5	3.4	4.8	6.1	3.4
♀, Wanetsi River, Mozambique	10.5	3.2	4.2	4.7	2.9
♀, Salisbury, Southern Rhodesia	12.5	3.2	4.5	6.	3.2
♀, Boksburg, Transvaal	10.4	3.1	4.2	4.7	2.9

The above measurements show that while the largest male I have seen is from a medium elevation in Kenya Colony (i.e. Kiboko, at approximately 3200 feet altitude), in that sex there is a great amount of individual plasticity in the size range, particularly of the tegmina. Available series are all too limited to give a clear picture as to whether there is any appreciable correlation of this variation, but the extremes of the eight males from Pretoria, and the great difference between the two males from Grootdraai taken the same month, would seem to indicate little geographic correlation of the observed size fluctuation in the male sex. In the female sex, however, while the specimens available are relatively few, there is apparently a size decrease southward, with in the same direction a very marked, and proportionately greater, reduction in tegminal length, these organs reaching a minimum where they are hardly more than 1.5 times the pronotal length, while the available Kenya females have the ratio almost or quite double that found in the Wanetsi River and Boksburg minima (approximately 1.5).

I have already presented some notes on the color variation found in male Transvaal and Natal material of this species.³⁴ With the larger series now available it is apparent that while general tonal fluctuation is present it is much less pronounced than in *supellectilium*. The generally palest specimen seen is that from Gura, Eritrea, in which the dark pattern, while quite evident, is lighter in tone than in any other male. The dark pronotal disk in the male ranges from solidly dark (Gura, Eritrea; Rogoro, Kikuyu Forest, Kenya; Athi River Crossing, Kenya; Kibwezi (1 of 2), Kenya;

³³ Abdomen somewhat abnormally contracted.

³⁴ As *S. supellectilium*, Ann. Transv. Mus., IX, pp. 18-19, (1922).

N. W. Shore of Lake Nyasa, Nyasaland; Salisbury, Southern Rhodesia (1 of 2); Gaberones, Bechuanaland Protectorate (1 of 3); Plat River, Transvaal; Wanetsi River, Mozambique (1 of 2); Guengère, Mozambique (1 of 2)) to an opposite extreme in which within the dark disk is the median pale marking so well shown in Distant's figure of the synonymous *Phyllodromia delta*,³⁵ which in shape varies from a subcircular spot, through a reversed deltoid figure and a longitudinally disposed lozenge-shaped marking, to a narrow medio-longitudinal dash covering over half the length of the disk, which latter condition is apparently not frequent and seen only in the Louw's Creek male. Rarely the pale disk marking is divided in two transversely by a dark band, this noticed only in one of those labelled "Hillside, Southern Rhodesia", in which a small cephalic subdeltoid pale spot is followed caudad by a larger subsagittiform pale area, and in one of the Salisbury, Southern Rhodesia males, which has the whole center of the disk pale, this divided into a small cephalic spot and a far larger reversed deltoid one, which covers a large part of the disk. The latter individual has the greatest reduction in the male of the dark elements of the disk pattern which I have seen. In those male individuals with the pale median disk spot, the size of the same is as variable as its outline.

The dark elements of the face pattern show a considerable range in emphasis and extent, built around a solidly infusate occiput and frons and three pairs of median dark spots arranged in a vertically disposed double series on the face. The male tegmina have the dark element of the pattern rarely solid and unbroken over the entire discoidal and anal fields, evenly paling distad in the former and sharply contrasted with the pale costal and scapular areas in the humeral region. This color type is generally, but not invariably, correlated with a solidly dark pronotal disk, the solidity of this tegminal dark area apparently breaking at proximal third before the dark pronotal disk is weakened mesad. When the dark humeral marking is invaded or ruptured at the proximal third by the paler coloration, the distal extent of the dark pattern is correspondingly curtailed, and the same then rarely extends distad of the middle of the tegmina. Whether the proximal pale invasion completely breaks, or merely constricts the dark area is not noticeably correlated with any other specific fluctuation of the color pattern. Doubtless the background for at least some of these color combinations is genetic.

In the female sex the pattern of the pronotal disk fluctuates essentially as in the male. The solidly dark disk is seen in the females from the Athi River Crossing, and the Narossura River in Kenya, while the female from Kibwezi has a large subcircular pale spot, which is larger, more extensive

³⁵ Insect. Transv., I, pl. I, fig. 4, (1900).

cephalad and less circular in that from Elisabethville, Belgian Congo. The Delagoa Bay female has a narrow transverse pale bar slightly caudad of the middle of the disk, while the Salisbury, Southern Rhodesia individual of that sex has two discal pale spots, the one much the smaller cephalad of the larger one. The other South African females have a single pale spot, sub-circular to lozenge-shaped. The Kenya females have the discoidal, scapular and anal fields of the tegmina quite solidly dark except for an intrusive and nearly complete³⁶ pale cross-bar slightly premedian in position, and a subobsolete scapular pale nick in the dark area at distal fifth. In the Elisabethville, Belgian Congo female the transverse pale bar is very marked and broad, and the scapular nick is larger than in the Narossura River, Kenya female, with both of which features is correlated a very large pale pronotal discal spot. The Bindura, Northern Rhodesia female shows a faint trace of the scapular pale nick, which, however, is not seen in the other South African females. In all of these the transverse pale bar is more oblique and disto-sutural in trend than in the more northern females, and also in them this bar fails to reach the sutural margin. In the majority of the females seen the head is quite solidly infusate with a narrow pale medio-vertical area on the ventral portion of the face. In the females seen the intensive condition is most marked in the Narossura River, Kenya individual, the most recessive in that from Elisabethville, Belgian Congo.

Distribution.—The known range of this species extends north and south across eastern Africa from the elevated portion of Eritrea (Gura) to eastern Cape Province (East London), reaching the coast at least in the latter area, in Zululand and at Delagoa Bay, and doubtless at numerous other points. The western limit of its distribution, as far as definitely known to me at this time, can be given as southeastern Katanga, Belgian Congo (Elisabethville and Welgelegen), Victoria Falls, Southern Rhodesia and between Ghanzi and Lake Ngami, Bechuanaland Protectorate. The Gura, Eritrea record may be that of an accidental introduction, as it was taken at a war-time air base at which much aerial transport was in regular movement to and from areas to the southward. In eastern Kenya Colony (i.e. from the eastern thorny-bush belt west to the Narossura River),³⁷ however, the species is clearly native and present over an area of quite diverse conditions.

The adults examined represent every month in the year except May, September and November, and from this evidence the species must be present adult in at least some part of its range during the entire year.

³⁶ In the Narossura River female this is by no means complete and is indicated in the discoidal field by little more than a pale spot. This intensive color condition is correlated in this specimen with a solidly dark pronotal disk and a nearly solid facial infuscation.

³⁷ The Narossura River is an affluent of the Southern Guaso Nyiro. It rises near 1° 40' S., 35° 45' E., and joins the Southern Guaso Nyiro at 1° 37' S., 36° 06' E. I have this information through the cooperation of my friend Dr. James P. Chapin.

Specimens examined: 65; 42 ♂, 14 ♀, 9 juvs.

ERITREA: Vicinity of Gura, 30 kilometers S. of Asmara, elev., 6400-6800 feet; VI-XII, 31, 1942; (J. W. H. Rehn); 1 ♂; [A. N. S. P.].

KENYA COLONY: Rogoro, Kikuyu Forest; VIII, 14-X, 29, 1899; (C. S. Betton); 1 ♀; [B. M. N. H.]. Kiboko, S. E. of Simba, Machakos District, Ukamba Province; VII, 28, 1934; (George Vanderbilt Afr. Exp.; H. T. Green, "at light at night"); 2 ♂; [A. N. S. P.]. Athi River Crossing 16 miles N. N. E. of Kibwezi, Machakos District, Ukamba Province, elev. 1400 feet; VII, 19 and 23, 1934; (George Vanderbilt Afr. Exp.; J. A. G. Rehn, "taken with light at night running on bark of a large acacia tree" (♂) or "found at night dead on ground" (♀); 1 ♂, 1 ♀; [A. N. S. P.]. Kibwezi, Machakos District, Ukamba Province, elev. 3000 feet; II, 15, 1922, XII, 2, 1921; (R. A. Dummer); 2 ♂, 1 ♀; [A. N. S. P.]. Narossura River; 1913; (W. P. Lowe); 1 ♀; [B. M. N. H.].

NYASALAND: Northwest shore of Lake Nyasa from Florence Bay to Karonga, elev. 1650 feet; VI, 30-VII, 6, 1910; (S. A. Neave); 1 ♀; [B. M. N. H.].

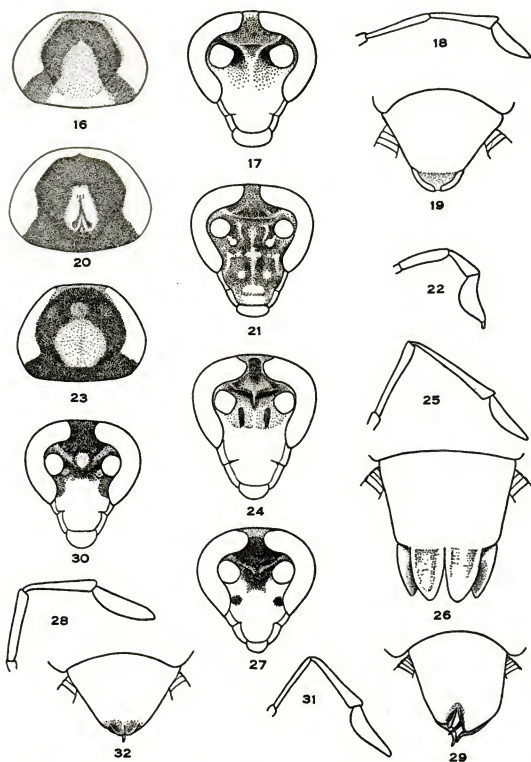
BELGIAN CONGO, KATANGA: Elisabethville; (Poppe); 1 ♀; [Mus. Belg. Congo]. Welgelegen; VI, 16, 1912; (Dr. Bequaert); 1 ♂; [Mus. Belg. Congo].

MOZAMBIQUE: Guengère, Pungwe Valley; IV, 1906; (G. Vasse); 1 ♂; [A. N. S. P.]. Region of Sungwe, Province of Gorongosa, elev. 40 meters; VIII, 1907; (G. Vasse); 1 ♀; [Paris Mus.]. Wanetsi River; VII, 1923; 2 ♂, 1 ♀; [So. Afr. Mus. and A. N. S. P.]. Delagoa Bay; (J. de Costa); 1 ♀; [A. N. S. P.]. Lourenço Marques; (Dr. G. Audeoud); 1 ♂; [Geneva Mus.].

SOUTHERN RHODESIA: Victoria Falls; VII, 1911; (L. Peringuey); 1 ♂; [So. Afr. Mus.]. Bindura; (D. Coghill); 1 ♀; [So. Afr. Mus.]. Salisbury; I, 1906; (G. A. K. Marshall); 1 ♂; [B. M. N. H.]. (D. Dodds): 1 ♂; [So. Afr. Mus.]. (R. W. Tucker); 1 ♀; [A. N. S. P.]. Insiza; (G. French); 1 ♀; [So. Afr. Mus.]. Bulawayo; (R. W. Tucker); 1 ♂; [A. N. S. P.]. Hillside; II, 6, 1923, XII, 12, 1921; (Swinburne and Stevens); 2 ♂; [Transv. Mus. and A. N. S. P.].

BECHUANALAND PROTECTORATE: Between Ghanzi and Lake Ngami; VII, 28, 1930; (de Schauensee Exped.); 1 juv.; [A. N. S. P.]. Botletle River near Maun; VIII, 4-11, 1930; (de Schauensee Exped.); 1 juv.; [A. N. S. P.]. Kuke Pan; III, 21-30, 1930; (Vernay Lang Exp.); 2 ♂; [Transv. Mus. and A. N. S. P.]. Gaberones; II (on two), 1915; (Ellenberger) 3 ♂; [Paris Mus. and A. N. S. P.].

TRANSVAAL: Pietersburg; 1904; (Janse); 1 ♀; [So. Afr. Mus.]. Groot-drai, Olifants River, N. E. Transvaal; X, 1927; (H. Lang); 2 ♂; [Transv.



Supella abbotti new species. Male (type); Rabai, Kenya Colony. Fig. 16.—Pronotum (much enlarged). Fig. 17.—Cephalic view of head (much enlarged). Fig. 18.—Palpus (greatly enlarged). Fig. 19.—Subgenital plate in ventral aspect (greatly enlarged). Female (allotype); Mlange, Nyasaland. Fig. 20.—Pronotum (much enlarged). Fig. 21.—Cephalic view of head (much enlarged). Male (paratype); Mlange, Nyasaland. Fig. 22.—Abnormal palpus (greatly enlarged).

Supella chapini new species. Male (type); Rungu, Belgian Congo. Fig. 23.—Pronotum (much enlarged). Fig. 24.—Cephalic view of head (much enlarged). Fig. 25.—

Mus. and A. N. S. P.]. Acornhoek, Pilgrimsrest District; 1 juv.; [A. N. S. P.]. Newington, Pilgrimsrest District, X, 1912; (J. P. Fenoulhel); 1 ♂; [Albany Mus.]. Moordrift, Potgietersrust District; X, 1907, XII, 1914; (C. J. Swierstra); 3 ♂; [Transv. Mus. and A. N. S. P.]: I, 1925; (G. van Dam); 1 ♂; [Transv. Mus.]. Plat River, Waterberg District; (C. J. Swierstra); 1 ♂; [Transv. Mus.]. Pretoria; IX, 1908; (C. J. Swierstra): 1 ♂; [Transv. Mus.]: XII, 2-27, 1911; (Capt. Paget); 5 ♂; [Transv. Mus. and A. N. S. P.]: VIII, 1913; (Lord Gladstone); 1 ♂; [A. N. S. P.]: VI, 1, 1927; 1 ♂; [B. M. N. H.]. Boksburg; 1911; 1 ♀; [So. Afr. Mus.]. Louw's Creek, Barberton District; III, 1900; (G. van Dam and A. Rob); 1 ♂; [Transv. Mus.]. Magude; X, 1918; (C. J. Swierstra); 2 ♂; [Transv. Mus. and A. N. S. P.].

ZULULAND: St. Lucia Bay; X, 1919; (Bell-Morley); 1 ♂; [A. N. S. P.].

CAPE PROVINCE: East London, IV, 4, 1916; 1 juv.; [B. M. N. H.].

SOUTH AFRICA: Political area undeterminable: Deinap; I, 1923; 1 juv.; [So. Afr. Mus.]. Mafa; II, 1923; 4 juvs.; [So. Afr. Mus.].

Supella abbotti³⁸ new species

Text-figs. 16-22; plate I, figs. 35 and 36.

This striking and beautiful species can readily be distinguished from *hottentotta* by the features given in the key on a preceding page. It is a stouter, broader insect than either *S. supellectilium* or *hottentotta*, with less marked difference between the sexes in appearance or proportions than in any other species of *Supella*. The limbs, and particularly the tibiae, are stouter than in *hottentotta*, while the head is less broadly cordiform and deeper in proportion to its breadth than in that species. The color pattern is quite distinctive, particularly the pale pencilling of certain veins, which is marked in the females seen.

Type.—♂; Rabai, Coast Province, Kenya Colony. October-December, 1911. (K. St. A. Rogers.) [British Museum of Natural History.]

Size relatively large for genus (length of body, 12.7 mm.; of tegmen, 15.1); general form broader and stouter than in *S. supellectilium* or *hottentotta*; surface moderately polished.

³⁸ In memory of an old and valued friend and fellow-naturalist, the late Dr. William Louis Abbott, one of the greatest field zoologists and zoological patrons of the past half century. His first extensive foreign field expedition was to the Kilimanjaro region in 1888 to 1889, and as his starting point was the old Rabai Mission, from which this species is described, this dedication is particularly fitting.

Palpus (greatly enlarged). Fig. 26.—Subgenital plate in ventral aspect (somewhat conventionalized on account of drying shrinkage) (greatly enlarged).

Supella mirabilis (Shelford). Male; Lambaréné, Gaboon. Fig. 27.—Cephalic view of head (much enlarged). Fig. 28.—Palpus (greatly enlarged). Fig. 29.—Subgenital plate in ventral aspect (greatly enlarged).

Supella gemma new species. Male (type); Aburi, Gold Coast. Fig. 30.—Cephalic view of head (much enlarged). Fig. 31.—Palpus (greatly enlarged). Fig. 32.—Subgenital plate in ventral aspect (greatly enlarged).

Head narrow cordiform or subpyriform, the greatest breadth across the eyes equal to nine-tenths the greatest depth of the head (as 43 to 48), the point of greatest breadth at dorsal border of antennal scrobes, the lateral outlines of the head, as viewed in facial aspect, arcuately converge ventrad to the buccal region; outline of occiput and dorsum of eyes as seen in same aspect regularly arcuate; interspace between eyes narrow, equal to but five-twelfths of that between internal borders of the antennal scrobes; frons with the usual transverse angulation characteristic of the genus, and particularly the subgenus *Supella*, well marked, as seen in facial aspect arcuate and somewhat flattened mesad; palpi³⁹ elongate and slender, penultimate article equal to approximately two-thirds the length of the antepenultimate, the former subequal in length to the ultimate (ratios of the three—antepenultimate as 16, penultimate as 23, ultimate as 16), penultimate in outline delicately infundibuliform distad, the ultimate subsecuriform. Antennae incomplete in type, surpassing the body length by at least that of the pronotum in paratype males in which they are undamaged.

Pronotum rounded subtrapezoidal in outline, transverse, the median length contained nearly 1.4 times in the greatest breadth (as 65 to 90); cephalic margin moderately arcuate, passing evenly into the obliquely arcuate lateral margins, which broadly round over the point of greatest breadth, which is at three-fifths of the pronotal length, into the transverse low arcuate caudal margin; lateral sections of surface moderately oblique declivent laterad, disk caudad of middle with a pair of appreciable converging impressions which fail to reach the caudal margin.

Tegmina in length appreciably surpassing that of the body, exceeding the apex of the abdomen by slightly more than the pronotal length, lanceolate, the greatest breadth, which is mesad, contained slightly more than three times in the tegminal length; costal and sutural margins straight and subparallel in middle half of tegmen, the former broadly arcuate proximad to the base and more sharply bowed distad to the well-rounded tegminal apex, the latter less strongly arcuate proximad and more broadly arcuate to the apex distad; marginal field broad, being twice as broad as in *hottentotta* and even more so than in *supellectilium*, its width subequal to one-sixth the greatest breadth of the tegmen, the field reaching distad to a point one-third the total tegminal length, scapular field very broad, equal at the middle of the tegmen to a full half the breadth of the latter, the discoidal field there appreciably narrowed by the incurving of the elements of the humeral trunk, anal field elongate subpyriform, its greatest breadth subequal to one-third of its length; scapular rami approximately thirteen in number, several bifurcate, discoidal sectors more sublongitudinal than in either *supellectilium* or *hottentotta*, particularly the latter, seven in number, several being bifurcate, intercalated nervures less conspicuous than in *hottentotta*, anal vein marked, axillary veins five in number. Wings essentially as in male of *S. hottentotta*, apex well rounded; costals somewhat fewer than in *hottentotta*, numbering approximately fourteen, virtually without thickening; ulnar vein with four rami, one bifurcate.⁴⁰

³⁹ One palpus is abnormally shortened.

⁴⁰ The bifurcation is adventitious and individual, as so often happens in connection with these rami.

Abdomen with the gland structure of the seventh tergite essentially as in *S. hottentotta* and *supellectilium*, transverse, bifossulate with the lateral rims arcuate and appreciably converging both cephalad and caudad, the medio-longitudinal division but moderately elevated and the lining hairs adpressed; caudal margin of sixth tergite broadly concave for the greater portion of its width, thus more completely exposing the glandular section of the seventh; supra-anal plate short, strongly transverse, its median length equal to .6 of the greatest proximal breadth, distal margin obtuse-angulate, its median angle narrowly rounded, the adjacent dorsal surface moderately tumid transversely and separated from that of the body of the plate by a transverse subconcave impression; cerci subequal to pronotum in length,⁴¹ relatively broad in proximal section, tapering in distal half, apex aciculate, dorsal surface much more deplanate than ventral; subgenital plate, as seen in ventral aspect, subtrigonal, slightly longer mesad than greatest proximal width, lateral margins in same view obliquely, but not quite symmetrically, convergent distad, its ventral surface transversely convex, its ventral profile straight, apex in ventral view rounded rectangular, the styles almost touching distad and in repose position embracing the apex of the plate, each style equally subfalcate as seen from venter, subequal in breadth, their ventral surface distinctly concave longitudinally to the bluntly rounded apices, dorsal surface transversely convex.

Limbs robust (for the genus), the median and caudal femora particularly deep and compressed; cephalic femora with armament as typical of the genus, ventro-caudal margin distad with four spines, including the apical; spines of both ventral margins of median and caudal femora stout and long and regularly spaced; caudal tibiae 1.35 times as long as the caudal femora,⁴² moderately compressed, their spines stout; caudal tarsi incomplete (in all males seen).

Allotype.—♀; Mlanje, Nyasaland. November 8-9, 1912. (S. A. Neave.) [British Museum of Natural History.]

Differing from the above description of the male sex in the following noteworthy respects.

Size large for genus, of definitely larger size and greater bulk than the male (length of body, 15.6 mm.; of tegmen 16.4).

Head with general features as in male, greatest breadth across eyes slightly less than in male, equal to .86 of head depth (as 50 to 58); occipital interspace between eyes as in male and therefore quite narrow for the female sex; transverse angulation of frons as marked as in male, as seen in cephalic aspect with median flattening more extensive than in male and occupying the greater part of length of frons; palpi as in male except that the antepenultimate and ultimate are proportionately more elongate, the ratios being antepenultimate as 18, penultimate as 22, ultimate as 19. Antennae incomplete in allotype.

Pronotum in general form similar to that of male, but slightly less transverse, the median length contained no more than 1.3 times in the greatest

⁴¹ Of the males before me solely that from Tendaguru has the cerci perfect, and these proportions are taken from it.

⁴² As the caudal tibiae are lacking or broken in the type these proportions have been taken from a paratype.

breadth (as 80 to 103); surface impressions and declivity of lateral areas evident but to a less degree.

Tegmina in length but faintly surpassing that of the body, exceeding the abdominal apex by no more than the pronotal length, broader lanceolate than in male, the greatest breadth contained 2.8 times in the tegminal length; costal margin as a whole more arcuate than in male, mesad not parallel with the straight median section of the sutural margin, apex as in male; fields and veins disposed as in male, but scapulars somewhat more numerous, approximately fifteen in number.

Abdomen without dorsal gland specialization; supra-anal plate transverse, low trigonal, lateral sections of distal margin convergent distad and weakly concave, apex U-emarginate; cerci slightly shorter than pronotum; subgenital plate transverse, median length slightly greater than half of proximal width (as 44 to 80), distal margin broadly arcuate between the shallow infra-cercal emarginations, middle of margin (i.e. apex) subobsoletely emarginate.

Limbs as in male but with the greater degree of robustness characteristic of females of this and related genera; caudal tarsi with metatarsus equal to five-ninths of the total tarsal length.

Coloration.—Pale base color light ochraceous-buff, translucent on the tegmina and lateral portions of the pronotum, dark pattern cinnamon-brown to mummy brown. Head basically dark, with a pattern ranging from one extreme in which there is a narrow transverse sublunate pale bar on the frons, the face with a medio-vertical sword-shaped pale figure and three vertically disposed pairs of pale spots,⁴³ plus pale lateral borders to the face and a uniformly pale buccal region, to an opposite extreme in which all the pale markings are obsolete to subobsolete except for that of the buccal region and the transverse frontal bar, which latter, however, is larger and more pronounced than in the other extreme (type is in this phase); palpi largely dark, distal section of ultimate and penultimate pale; eyes bister to mummy brown; antennae with two proximal articles pale, remainder cinnamon-brown to prout's brown. Pronotal disk solidly dark except for a median pale figure, which latter fails to reach the cephalic margin and generally does not reach the caudal margin of the pronotum (does in the type and the Tendaguru paratypic male), and in shape ranges from sagittately trigonal to blunt cuneiform, the apex always cephalad and occasionally this is evenly arcuate (type) or abruptly truncate (both females); lateral areas pale translucent. Tegmina in the males with three principal dark cloudings, one involving the sutural side of the proximal fourth of the humeral trunk, the ulnar base, the anal vein and the immediately adjacent axillaries, as well as longitudinal dark pencillings between the axillaries more sutural in position, a second area approximately at the middle of the humeral trunk and which by a lighter wash suffusion is connected with the other dark areas, and a third at distal third involving the humeral trunk and the proximal portions of certain costal veins, the extent of each of these, their emphasis and the degree to which they are subcoalescent is correlated with the general pattern emphasis; in the females seen (two)

⁴³ The median one of these pairs is occasionally connected to the median marking by pale extensions.

the tegminal pattern described for the male is found in a more intensified form, areas being solidly mummy brown, shading into russet dilutions, with the venation solely in those areas which are pale in the more recessive pattern, and which are here solidly dark, strikingly pencilled in cream-buff.⁴⁴ Wings with veins pencilled in tawny-olive. Dorsum of abdomen pale mesad, infusate to a variable degree laterad, the more distal tergites with marginal subcircular pale spots surrounded by the darker tone; in the females the dorsum is almost solidly dark, but the venter, which is pale mesad, is heavily infusate laterad and distad, with similar encircled lateral pale spots; cerci infusate or in certain males paling proximad. Limbs with femora lined dorsad to a variable degree with the dark tone, this most pronounced in the females; coxae variably marked with dark; tibiae also washed to a variable degree with dark about spine base groups, spines tawny. In the intensive extreme the tarsi have the proximal section of the caudal metatarsus and most of the second and third tarsal articles washed with dark.

Measurements (in millimeters)

	Length of body	Length of pro- notum	Greatest breadth of pro- notum	Length of tegmen	Greatest breadth of tegmen
♂, Rabai, Kenya, (<i>type</i>)	12.7 ⁴⁵	3.4	4.7	15.1	4.9
♂, Tendaguru, Tanganyika (<i>paratype</i>) ..	14.6	3.4	4.5	15.4	4.7
♂, Mlanje, Nyasaland (<i>paratype</i>)	13.5	3.4	4.8	15.4	4.8
♀, Mlanje, Nyasaland (<i>allotype</i>)	15.6	4.0	5.3	16.4	5.8
♀, Mlanje, Nyasaland (<i>paratype</i>)	15.1	4.0	.. ⁴⁶	15.4	5.2

Variation.—The range in color pattern has been set forth in the above color description. Two of the males show evidence of palpal development arrest or regeneration. The type has the left palpus definitely shorter than the right, which is normal for the species, but there is nothing teratological about the left one except for its reduced size and the less attenuate penultimate and antepenultimate articles. One of the Mlanje male paratypes, on the other hand, has the left palpus normal but the right one is greatly reduced and abnormal, in length little more than half the norm, antepenultimate article very short, the penultimate quite brief and markedly infundibuliform, and the ultimate also quite short and strongly securiform, with a brief terminal mammilliform nodule (see fig. 22).

Distribution.—This species is known from but three localities in East Africa, one Rabai in coastal Kenya Colony, another Tendaguru, a short distance from the coast in southern Tanganyika Territory, and the third, Mlanje, a classic locality in southern Nyasaland. Doubtless the future will show it occurs over a considerable area in eastern Africa.

⁴⁴ This is intimated in some of the males by the intervenous dark markings, but is there never as pronounced as in the two females before me.

⁴⁵ Abdomen somewhat contracted.

⁴⁶ One side of pronotum is damaged.

Specimens examined: 6; 4 ♂, 2 ♀.

KENYA COLONY: Rabai; X-XII, 1911; (K. St. A. Rogers); 1 ♂ (*type*); [B. M. N. H.].

TANGANYIKA TERRITORY: Tendaguru,⁴⁷ Lindi Province; mid VIII-mid XI, 1909; (Janensch); 1 ♂ (*paratype*); [Berlin Mus.].

NYASALAND: Mlanje; XI, 8-9, 18, 1912, XII, 2, 1912; (S. A. Neave); 2 ♂ (*paratypes*), 2 ♀ (*allotype* and *paratype*); [B. M. N. H. and A. N. S. P.].

MOMBUTTIA⁴⁸ new subgenus

This subgenus can at once be distinguished in both sexes from restricted *Supella* by the narrower head, and the much more elongate palpi and caudal metatarsi. It agrees with the subgenus *Nemosupella*, and thus also differs from true *Supella*, in the absence of dorsal abdominal gland specialization in the male sex.

Genotype (here selected).—*Supella* (*Mombuttia*) *chapini* new species.

Subgeneric characters.—Sexes relatively diverse, males with ample and elongate tegmina and wings, females with same little surpassing abdominal apex. Head relatively narrow, breadth across eyes distinctly less than head depth, transverse facial ridge obtuse-angulate, apex pointing ventrad; palpi with penultimate and antepenultimate articles very elongate and slender, ultimate articles not more than two-thirds as long as penultimate. Tegmina in male in general as in *Supella* s. s., in female broad, short, apex well rounded. Abdominal dorsum of male with seventh tergite bearing a glandular specialization essentially as in *Supella* s. s. Subgenital plate of male with distal extremity deeply and narrowly divided into two rounded acute-angulate lobes, styles of male subgenital plate simple, incurved, neither aciculate distad. Limbs more slender proportionately than in *Supella* s. s.; cephalic femora with spines of ventro-cephalic margin regularly diminishing in length distad; caudal tarsi very slender, metatarsus in length much exceeding the remaining tarsal articles combined.

Distribution.—The single known species of this subgenus is found in the northeastern Belgian Congo.

Supella (*Mombuttia*) *chapini*⁴⁹ new species

Text-figs. 23-26.

Type.—♂; Rungu, Uele District, Belgian Congo.⁵⁰ June 24, 1913. (American Museum Congo Expedition; Lang and Chapin.) [American Museum of Natural History.]

⁴⁷ Tendaguru, the famous African dinosaur locality, is fifty-six miles inland from the port of Lindi.

⁴⁸ After the Mombuttu people of the northeastern Belgian Congo.

⁴⁹ For my long-time friend, Dr. James P. Chapin, of the American Museum of Natural History, outstanding student of African zoology, who was one of the collectors of the type.

⁵⁰ Rungu is on the Bomokandi River at approximately 3° 10' N., 27° 50' E.

Size medium (for genus); form elongate, slender; surface polished.

Head in outline, as seen in facial aspect, reversed cordiform, the greatest breadth across the eyes contained slightly more than 1.5 times in the greatest head depth (as 39 to 60), the eye outline in same aspect evenly and arcuately rounded; occipital interspace between eyes relatively narrow, but two-thirds that between internal margins of antennal scrobes; palpi very slender and elongate, the ultimate alone of greater proportionate depth than the others, this in length equal to but two-thirds that of the penultimate (as 21 to 33), in profile slender subsecuriform, its dorsal outline concave to near the moderately acute apex, ventral margin moderately arcuate with a straight section distad, moderately compressed as seen from dorsum, penultimate article exceedingly slender and attenuate, subinfundibuliform distad, its length slightly greater than half the depth of the head (as 33 to 60), antepenultimate article approximately four-fifths as long as the penultimate one (as 27 to 33), quite slender, of uniform thickness. Antennae more than twice as long as the body.

Pronotum in general form as in *Supella* s. s., median length contained slightly more than 1.3 times in the greatest width (as 65 to 89), the latter being at the caudal third; cephalic margin equal in width to approximately one-third the entire pronotal breadth, evenly rounding laterad into the oblique, caudad-diverging arcuate lateral borders, which broadly round over the point of greatest width to the broad truncate-arcuate caudal margin; surface of disk caudad with paired short converging impressions, as in forms of true *Supella*.

Tegmina surpassing apex of abdomen by approximately 1.3 times the pronotal length, their length equal to slightly more than 3.5 times their greatest breadth, their form lanceolate; costal margin with proximal third moderately arcuate, straight thence distad to distal fourth, whence to the rather narrowly rounded apex the margin is more strongly arcuate, sutural margin nearly straight except in distal fourth, which is arcuate much as in the same section of the costal margin; marginal field very narrow, little broader than the interspace between the eyes, its apex reaching to slightly distad of the proximal third of the tegmen; humeral trunk slightly suturad of the longitudinal axis of the tegmen, subsinuate in general direction, scapular veins numbering approximately fifteen (including rami), discoidal sectors eight in number, but moderately oblique, anal vein little sigmoid mesad, axillary veins six in number. Wings with ulnar vein quadrimargose.

Abdomen with glandular area of seventh tergite more strongly transverse than in true *Supella*, as in that group failing to reach the caudal margin of the tergite, the caudal margin of the excavate area strongly thickened and subtumid; supra-anal plate strongly transverse, distal margin arcuate-angulate;⁵¹ cerci elongate sagittate, approximately 1.5 times as long as the pronotum, broadest very briefly distad of base, evenly tapering thence to the aciculate apex, dorsal surface deplanate, ventral surface with articles individually roundly tumid, the same surface and lateral margins bearing numerous chaetae and setae; subgenital plate narrowing distad, the distal section with its median division well marked and extending proximad at least as far as the styler bases, the two lobate sections mesad in contact

⁵¹ The type has at one time been immersed in a wet preservative, and in consequence shrivelling has to a degree obscured the original form of certain abdominal parts.

in proximal half of their length, both lying in a horizontal plane and deplanate ventrad, apices of the lobate sections rounded acute, styles undifferentiated, incurved, tapering, distad subexcavate ventrad, apices blunt acute, not at all aciculate.

Cephalic femora moderately slender, evenly tapering, ventro-cephalic margin with spine series of uniform type but elements decreasing in length distad, ventro-caudal margin with but a single spine in addition to the distal one. Median and caudal femora relatively slender for genus, ventral margins well spined; caudal tibiae quite elongate; caudal tarsi very elongate and unusually slender, the metatarsus over 1.5 times as long as the remaining tarsal articles combined.

Allotype.—♀; Moto, Uele District, Belgian Congo.⁵² 1920. (L. Burgeon.) [Museum of the Belgian Congo.]

Differing from the preceding description of the male in the following noteworthy respects.

Form somewhat stouter than in male, tegmina and wings much shorter. Head in general character as in male but broader across the eyes, the width there contained but 1.25 times in the greatest head depth (as 51 to 64), the eye outline, as seen in facial aspect, faintly less strongly arcuate laterad; occipital interspace between eyes but slightly less than that between internal margins of antennal scrobes (as 14.5 to 16); palpi slightly less slender than in male, but very elongate for the sex, and with proportions and general form otherwise as in male. Antennae incomplete, but at least surpassing the body length.

Pronotum in general much as in male, but owing to accidental compression in preparation its exact proportions cannot be computed exactly, margins as in male.

Tegmina very briefly surpassing the apex of the abdomen, quite broad lanceolate with apex rather broadly rounded, greatest breadth mesad contained but 2.75 times in the tegminal length; costal margin as a whole arcuate, evenly passing to the relatively broad and full apex, which latter more obliquely passes into the arcuato-truncate sutural margin; marginal field quite narrow, slightly under the breadth of the occipital interspace between the eyes, its apex falling but slightly short of the middle of the tegmen.

Abdomen, as usual in the female, without glandular specialization; supra-anal plate transverse, distal margin low trigonal with a narrow median U-shaped emargination; cerci incomplete (in allotype); subgenital plate with distal margin arcuate as usual in genus.

Limbs largely lacking in allotype.

Coloration.—Base color (in both sexes) light ochraceous-buff, the overlying darker pattern cinnamon-brown to mummy brown, the latter tone almost entirely on the pronotal disk and along the caudal margin of the pronotum, completely encircling the pale central spot. Head pale with three transverse dark facial markings, the dorsal one interocular, the median one between the antennal bases broadly chevron-shaped with the apex pointed

⁵² Moto is in the upper Bomokandi drainage, approximately sixty-five miles east by southeast of Rungu, the type locality. Its position is roughly 29° 10' E., 2° 56' N.

ventrad, while the ventral one is U-shaped with the vertical lateral arms much stronger than the ventral transverse connecting cloud; near each palpal base is also a dark cloud; palpi weakly pencilled ventrad with fuscous, the antepenultimate also similarly marked dorsad; antennae infumate distad of proximal article. Center of pronotal disk with a circular (♂) or subhexagonal (♀) pale marking, which is completely surrounded by dark color, which also broadly involves the caudal margin of the pronotum, this with a discal dark annulus strongly contrasting with the pale translucent lateral portions of the pronotum. Tegmina basically pale, but bearing two marked and separate dark areas, one roughly subtrigonal involving much of the anal field and the base of the humeral trunk, a pale proximal transverse section completely separating the dark marking from the base of the anal field, the second dark area constituting a heavy clouding of the distal three-fifths of the humeral trunk, paling distad and sutured over the discoidal field, its relatively sharp costal definition subconcealedly eroded at three-fifths of the tegminal length (♂) or at distal third (♀) by an expansion of the pale costal area. Ventral surface and limbs as a whole pale, subgenital plate of female infuscate on each side, these narrowly divided by a longitudinal pale line extending cephalad from cercal bases.

Measurements.—♂ (type), length of body, 13.2 mm; length of pronotum, 3.5; greatest breadth of pronotum, 4.5; length of tegmen, 18.2; greatest breadth of tegmen, 4.8. ♀ (allotype), length of body, 13.0 mm; length of pronotum, 4.0; length of tegmen, 13.5; greatest breadth of tegmen, 5.0.

Distribution.—The species is known to date only from two localities in the Uele District of the Northeastern Belgian Congo (Rungu and Moto), along the northern border of the Lower Guinea Forest Faunal District.

Specimens examined: 2; 1 ♂, 1 ♀.

BELGIAN CONGO; UELE DISTRICT: Rungu; VI, 24, 1913; (Amer. Mus. Congo Exped.; Lang and Chapin); 1 ♂ (type); [A. M. N. H.]. Moto; 1920; (L. Burgeon); 1 ♀ (allotype); [Mus. Belg. Congo.].

NEMOSUPELLA⁵³ new subgenus

When compared with *Supella* s. s. and the subgenus *Mombuttia* the present subgenus can at once be distinguished from both by lacking, in the male sex, any abdominal dorsal glandular specialized structure, and in the styles of the subgenital plate in the same sex being strongly recurved laterad or strongly corniform and aciculate acute, as opposed to the depressed, subfalcate inward and simple type found in the other two subgenera.

Genotype (here selected).—*Phyllodromia mirabilis* Shelford.

Subgeneric characters.—Sexes less diverse than in *Supella* s. s., differing essentially in general appearance as in the subgenus *Mombuttia*, males with ample and elongate tegmina and wings, females more robust with tegmina and wings broader and in length less markedly surpassing the apex of the abdomen. Head pyriform in outline, transverse facial ridge nearly straight transverse, distinct but of varying emphasis in the two known species;

⁵³ From *Nemus*, forest, and *Supella*, in allusion to the general Forest Province range of the group.

palpi with penultimate and antepenultimate articles elongate, ultimate at least five-sixths as long as penultimate, Tegmina in male in general as in *Supella* s. s., in female narrowly surpassing apex of abdomen, broad, apex well rounded. Abdominal dorsum in male without a specialized glandular area. Subgenital plate of male divided distad as in all members of the genus, the lobes at apices rounded rectangular or acute-angulate, styles of male subgenital plate moderately asymmetrical, ranging from corniform with aciculate apices to strongly recurved laterad and non-aciculate distad. Limbs moderately robust for group, cephalic femora with spines as typical of genus; caudal tarsi moderately slender, metatarsus in length somewhat exceeding that of the remaining tarsal articles combined.

Distribution.—The species here referred to the subgenus *Nemosupella* are distributed from the Gold Coast (Aburi) eastward to Uganda (Kampala), and southward to Angola and the southeastern Belgian Congo (Katanga District).

Key to the Species of the Subgenus Nemosupella

(Males only)

Size somewhat smaller. Head in outline broader pyriform, proportionately wider across the eyes, this breadth equal to approximately nine-tenths of head depth; occipital outline transverse truncate as seen in cephalic aspect; frons subconcave; palpi of moderate length. Femora more slender. Subgenital plate with paired terminal lobes smaller; styles in their entirety recurved, acute but not aciculate distad. (Gold Coast.) *gemma* new species

Size somewhat larger. Head in outline narrower pyriform, proportionately narrower across the eyes, this breadth equal to little more than four-fifths of head depth; occipital outline moderately arcuate as seen in cephalic aspect; frons deplanate; palpi more elongate. Femora more robust. Subgenital plate with paired terminal lobes larger; styles elongate, corniform, with at most the apices alone recurved, the latter spiniform produced, aciculate. (Cameroons and Gaboon to Uganda.)

mirabilis (Shelford)

Supella (Nemosupella) gemma ⁵⁴ new species

Text-figs. 30-32; plate I, fig. 39.

The features given above in the key will readily distinguish the male sex of *gemma* from that of *mirabilis*. The character of the styles of the male subgenital plate will at once separate the two species, while the broader head and the less elongate palpi are quite as diagnostic. The female sex is as yet unknown.

Type.—♂; Aburi, Gold Coast. 1912-1913. (W. H. Patterson.) [British Museum (Natural History).]

Size large (for genus); general form as in relatives; surface dully polished.

Head reversed pyriform in outline as seen in cephalic aspect, broader proportionately across the eyes than in *S. (N.) mirabilis*, the greatest head depth being but 1.15 times that across the eyes (as 8.75 to 7.6), as against 1.22 (as 9.75 to 8) in *mirabilis*, the outline of the eyes, in same aspect, broadly rounded, occipital outline in this view transversely truncate, the

⁵⁴ In allusion to the signet-like character of the pronotal marking, as well as the generally ornamental color pattern.

frons subconcave, least eye interspace equal to approximately two-thirds that between internal margins of the antennal scrobes; palpi less elongate than in *mirabilis*, the antepenultimate article but two-fifths as long as the head is deep, as against six-elevenths in *mirabilis*, less attenuate, penultimate article evenly infundibuliform, the ultimate proportionately longer, equal to seven-eighths of the subequal length of the antepenultimate and ultimate articles, instead of but five-sixths of the same as in *mirabilis*. Antennae incomplete in type.

Pronotum in outline ovately subtrapezoidal, its greatest median length contained 1.4 times in its greatest breadth, which is slightly caudad of the transverse middle; cephalic margin low arcuate, broadly rounding into the obliquely arcuate cephalic portion of the lateral margins, the caudal margin broadly low arcuate, and broadly rounding latero-cephalad over the point of greatest breadth; surface of disk with the caudad converging impressions well marked.

Tegmina surpassing the apex of the abdomen by a distance somewhat greater than the pronotal length, in shape elongate lanceolate, its costal and sutural margins in median half subparallel, the former rather broadly arcuate in proximal fourth and more sharply so in distal fourth, sutural margin with distal fourth more obliquely arcuato-truncate to the rather narrowly rounded apex; marginal field very slightly broader than in *mirabilis*, general character of other fields and their venation as in *mirabilis*. Wings with apex slightly sharper than in *mirabilis*, costal veins fewer and more spaced than in *mirabilis*, nine in number, ulnar vein with six rami.

Dorsal surface of abdomen lacking glandular specializations; supra-anal plate transverse, low trigonal in outline, its median length equal to but one-fourth of its breadth between cereal axes, apex of distal margin truncate subemarginate; cerci tapering in width, deplanate dorsad, in general much as in *mirabilis*; subgenital plate in general outline subtrigonal, distad briefly fissate mesad, to a much lesser degree than in *mirabilis*, this flanked by paired subtrigonal attingent lobes, which are smaller than in *mirabilis*, well rounded distad and evenly recurving dorso-distad as seen in profile, styles somewhat smaller than in *mirabilis* and more similar in character, the dextral one subcompressed and evenly narrowing as seen in caudal aspect, its apex narrowly rounded, as seen from dorsum it is strongly and evenly arcuate counter-clockwise, sinistral style smaller than dextral and distad less produced but general curvature similar, dorsal borders of subgenital plate proximad of stylar insertions each with a mesad-reflexed subdeplanate section which regularly broadens distad to a transverse juxta-stylar extremity.

Limbs somewhat more slender than in *mirabilis*, the femora particularly so; cephalic femora with distal section of spine series of ventro-cephalic margin with three or four of the spines immediately proximad of the apical pair of strong spines replaced by chaetae,⁵⁵ ventro-caudal margin of the cephalic femora with but two spaced spines in distal section preceding the

⁵⁵ This may be a purely individual character which is intimated in certain members of the series of *mirabilis*. I am including it in the description of *gemma*, however, because it is indicated on both cephalic femora of the unique type, and thus may not be purely individual.

single apical one on that side; caudal tarsi with metatarsus slightly longer than remaining tarsal articles combined (as 50 to 43).

Coloration.—Pale base color ochraceous-buff, deepening on the anal and greater portion of the discoidal fields of the tegmina to honey yellow; dark markings ranging from prout's brown to mummy brown. Head dark with a pale circular spot between the antennal bases and most of the middle portion of the lower face pale, antennae with two proximal articles pale, becoming infusate thence distad, palpi pale with the proximal section of the ultimate article infusate. Pronotum with the pale lateral areas translucent, as pale as light ochraceous-buff, dark pattern made up of two elements arranged as in *mirabilis* and similarly not connected. Tegmina with infusate cloud in the area of the humeral trunk extending over approximately the proximal two-fifths of the tegmina, broken shortly before its distal end by the usual lobate intrusion of the very pale light ochraceous-buff tint of the marginal and part of the scapular fields, this intrusion virtually severing the dark marking, no other more distal pale intrusion of the humeral bar evident. Dorsal surface of abdomen laterad and distad washed with prout's brown, ventral surface similarly but less strongly infusate; cerci rather pale, infusate laterad on ventral surface. Femora with ventral margins and dorsal ones less distinctly lined with dark, tibial spine insertions touched with dark.

Length of body, 13.8 mm.; length of pronotum, 3.6; greatest width of pronotum, 5.2; length of tegmen, 15.9; greatest width of tegmen, 4.7.

The type of this species is unique. We can only speculate as to the characters which may be found to separate the as yet unknown female of *gemma* from that of the related *mirabilis*.

Supella (Nemosupella) mirabilis (Shelford)

Text-figs. 27-29; plate I, figs. 37 and 38.

1908. *Phyllodromia mirabilis* Shelford, Deutsche Ent. Zeitschr., 1908, p. 116, pl. II, fig. 3. [♂, ♀; Cameroons.]

Type material.—The original series of this species was contained in the Deutsche Entomologische National Museum. Whether it is in existence to-day cannot be determined at this time.

Variation.—This beautiful species exhibits a considerable amount of variation, and larger and more comprehensive series may show it to break up into recognizable geographic races. At present, however, it seems best to point out the variation observed and await the possibly elaborating evidence of further material.

In size there appears to be a regular increase eastward, the smallest individuals being from the western section of the species range in west central Africa, and the largest from Katanga and Lake Tanganyika, with, as far as available evidence goes, a regular transition in between. The following measurements (in millimeters) evidence this trend.

	Length of body	Length of pro- notum	Greatest breadth of pro- notum	Length of tegmen	Greatest breadth of tegmen
♂, Cameroons	13.3	3.9	5.4	16.3	5.2
♂, Lambaréné, Gaboon	14.8	4.2	5.6	16.9	5.3
♂, Mistandungu, Belg. Congo	14.9	4.4	5.8	17.7	5.3
♂, Fort Crampel, Ubangi-Shari	15.1	4.2	5.7	17.6	5.3
♂, Boende, Belg. Congo	14.3	4.4	.. ⁵⁶	17.9	5.7
♂, Lukolela, Belg. Congo	15.8	4.4	6.1	17.9	5.5
♂, Yambata, Belg. Congo	15.8	4.2	6.	18.5	5.7
♂, Kansenze, Belg. Congo	16.8	4.4	6.1	21.1	6.6
♂, Lake Tanganyika	17.9	4.5	6.3	21.	6.5
♂, Lake Tanganyika	17.6	.. ⁵⁷	6.2	21.1	6.5
♂, Mitiyana, Uganda	14.8 ⁵⁸	4.1	5.9	19.5	6.5
♀, Cameroons	12.2	3.9	.. ⁵⁹	11.4	4.7
♀, Lolodorf, Cameroons	14.6	4.5	6.1	14.3	5.5
♀, Lambaréné, Gaboon	14.5	4.5	.. ⁵⁹	13.	.. ⁶⁰
♀, Malela, Belg. Congo	12.5	3.9	5.3	.. ⁶¹	.. ⁶¹
♀, District of Equateur, Belg. Congo	14.8	4.7	6.3	13.5	5.5
♀, Dingila, Belg. Congo	16.1	4.7	.. ⁵⁹	13.8	5.5
♀, Kampala, Uganda	16.3	4.6	6.3	14.9	5.7

As the above figures show there is a size increase eastward, and probably in addition some areal size reduction, as suggested by the "Cameroons" pair and the Malela, Lower Congo female. Unfortunately exact locality is lacking for the first mentioned specimens.

The color pattern of the pronotum and tegmina is relatively uniform, the cephalic and caudal dark elements of the pronotal disk pattern not being connected laterad in adults of either sex, as far as present material goes, but in immature specimens these are always connected laterad, thus enclosing a transverse pale area of varying shape. The premedian pale oblique break in the solidity of the dark pattern is indicated in all adults of both sexes, and some much less definite and more shallow intimation of a premedian one is also noticed in all the material. The male from Kansenze, Katanga has the dark pronotal disk pattern paler than in any other individual, and the cephalic element is there quite definitely but narrowly divided medio-longitudinally in two by the pale discal color. The occiput and a median, usually hour-glass shaped, area on the lower face are always contrastingly pale, but the genae and the remainder of the head vary greatly in the extent to which they become solidly infuscate.

⁵⁶ Dextral border of pronotum broken.

⁵⁷ Cephalic margin of pronotum damaged.

⁵⁸ Body bent, measurement clearly under true length.

⁵⁹ Pronotum compressed.

⁶⁰ Tegmina curled too strongly for width to be measured accurately.

⁶¹ Tegmina damaged.

Shelford's original figure of the male subgenital plate (vide supra) is rather poor and somewhat conventionalized. While the sinistral style is as straight as shown by Shelford, the dextral one is always more arcuate distad curving laterodorsad, with its concave surface deplanate or even subexcavate (see fig. 29). The sinistral style is markedly inflated proximad with its apex finely aciculate. There is some little variation in the exact outline of each of the styles, but this is very difficult to put in words.

Distribution.—Almost entirely limited to the Lower Guinea Forest District and its adjacent savanna districts, i.e. the Uele-Ubangi, the Southern Congo, and the Uganda-Unyoro. The extreme known exact records are, Lolodorf in the Cameroons, Fort Crampel in Ubangi-Shari, Benguella in Angola, Kansenze in Katanga, Lake Tanganyika, and Kampala, Uganda.

Specimens examined: 26; 12 ♂, 9 ♀, 5 juvs.

CAMEROONS: (no exact locality); (Dr. Kraatz); 1 ♂, 1 ♀; [Vienna Museum]. Lolodorf; IX, 1926; (A. J. Good); 2 ♀; [Carnegie Mus. and A. N. S. P.]. Batanga; III, 1914; (T. H. Hope); 2 juvs.; [Carnegie Mus. and A. N. S. P.].

FRENCH EQUATORIAL AFRICA; GABOON: Lambaréné, Ogowe River; 1911 and 1912; (R. Ellenberger); 2 ♂, 2 ♀; [Paris Mus. and A. N. S. P.].

FRENCH EQUATORIAL AFRICA; UBangi-SHARI: Fort Crampel; 1 ♂, 1 juv.; [Paris Mus.].

ANGOLA: Benguella; (F. Creighton Wellman); 1 juv.; [A. N. S. P.].

BELGIAN CONGO; LOWER CONGO DISTRICT: Malela; II, 1913; (R. Verschueren); 1 ♀; [Mus. Belg. Congo]. Mistandungu;⁶² XI, 6, 1925; (R. P. Hulstaert); 1 ♂; [A. N. S. P.].

BELGIAN CONGO; LAKE LEOPOLD II DISTRICT: Lukolela; I, 13, 1931; (James P. Chapin); 1 ♂; [A. M. N. H.].

BELGIAN CONGO; EQUATEUR DISTRICT: (no exact locality); VIII, 1920; (L. Burgeon); 1 ♀; [Mus. Belg. Congo.]. Eala; X, 1929; (H. J. Brédo); 1 juv.; [Mus. Belg. Congo]. Boende; II, 17, 1926; (H. P. Hulstaert); 1 ♂; [Mus. Belg. Congo.].

BELGIAN CONGO; BANGALA DISTRICT: Yambata; III, 11, 1914; (De Giorgi) 1 ♂; [Mus. Belg. Congo].

BELGIAN CONGO; UELE DISTRICT: Dingila; VI, 20, 1933; (H. J. Brédo); 1 ♀; [A. N. S. P.].

BELGIAN CONGO; KATANGA: Kansenze; VI, 1924; (Ch. Seydel); 1 ♂; [A. N. S. P.].

⁶² I am unable to find a locality by this name on a number of charts of the Lower Congo District, and feel it may be a transcriptional error for Mukimbungu, a well-known mission station on the lower Congo.

LAKE TANGANYIKA: "On board S. S. Liemba; V, 21, 1930; (A. Love-ridge); 2♂; [M. C. Z. and A. N. S. P.].

UGANDA PROTECTORATE: Mityana; VII, 31, 1912; (C. C. Gowdey); 1♂; [B. M. N. H.]. Kampala; IX, 13, 1918; (C. C. Gowdey); 1♀; [B. M. N. H.].

Incertae sedis

The following species very probably is not a member of the genus *Supella*, showing as it does a number of features of difference such as the incrassate and hirsute antennae of the male and the apparently simpler head structure. However, as the original description, which is here reproduced, mentions little which might give a key to the generic position, the latter can be determined definitely only when material is available.

Supella amoena I. Bolívar

1924. *Supella amoena* I. Bolívar, Ann. and Mag. Hist., (9) XIII, p. 337. [♂, ♀; Desroches Island, Amirantes.]

"Albido-flavescens, fere hyalina. Caput inter oculos macula fusca, antice furcata, inter antennis macula magna, pallida, anguste fusco marginata. Antennae fuscae, basin versus pallidae, crassiusculae. Oculi nigri. Pronotum verticem leviter liberans, subtransversum, antrorsum sensim angustatum, antice quam postice angustius, lateribus late pellucidis, disco pallido, rotundato, nigro circumdato, limbo nigro marginibus antico posticoque includentibus, postice utrinque breviter producto. Elytra campo antico lato, quam postico parum angustiore, ramis discoidalibus obliquis, maxima parte in marginem posticum excurrentibus subhyalina, fascia lata fusco-nigra, in maculas duas soluta, marginem anticum haud attingente. Alae hyalinae, campo antico, praecipue apicem versus, lato; vena ulnari ramis 4 fusciscentibus divisa, area apicali parva, haud producta; campo antico apice rotundato, producto; vena axillari prima apice indivisa, retrorsum curvata. Pedes pallidi. Abdomen lateribus supra subtusque, et segmentis apicalibus dorsalibus, fuscis, connexivo pallido variegato.

"♂. Antennae distincto incrassatae, hirsutae. Elytra apicem abdominis valde superantia, macula fusca basali nigra, secunda minore. Lamina supra-analis trigona, transverse, parum producta.

"♀. Antennae filiformes, haud hirsutae. Elytra apicem abdominis tantum attingentia, macula secunda usque ad apicem elytrorum extensa.

"Long. corp. ♂ 10; pron. fere 2.5; elytr. 10 mm.

"Long. corp. ♀ 8, pron. fere 2.5; elytr. 6.2 mm.

"Loc. Amirantes: Desroches I., 1905, 5 examples (Gardiner).

"I place this species in the genus *Supella* Shelford (Ent. Mo. Mag. (2) XXII, 1911, p. 155), on account of its remarkable sexual dimorphism. I must record, however, that it has the hind wings provided with a triangular apical field. This triangular field or area is scarcely, if at all, produced, and the margin of the wing forms at this point a sinuosity, on account of the anterior field being strongly produced, although rounded at the extremity."

EXPLANATION OF PLATE

PLATE 1

Fig. 33.—*Supella supellectilium* (Serville). Female; Oahu, Hawaii. Dorsal view ($\times 2.6$).

Fig. 34.—*Supella hottentotta* (Saussure). Female; Kibwezi, Kenya Colony. Dorsal view ($\times 2.6$).

Fig. 35.—*Supella abbotti* new species. Male (type); Rabai, Kenya Colony. Dorsal view ($\times 2.6$).

Fig. 36.—*Supella abbotti* new species. Female (allotype); Mlange, Nyasaland. Dorsal view ($\times 2.6$).

Fig. 37.—*Supella mirabilis* (Shelford). Male; Lambaréné, Gaboon. Dorsal view ($\times 2.6$).

Fig. 38.—*Supella mirabilis* (Shelford). Female; Lolodorf, Cameroons. Dorsal view ($\times 2.6$).

Fig. 39.—*Supella gemma* new species. Male (type); Aburi, Gold Coast. Dorsal view ($\times 2.6$).



33



34



39



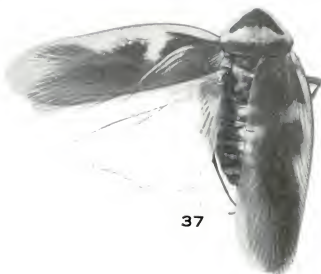
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REHN: AFRICAN AND MALAGASY BLATTIDAE

A SKULL OF *TOROSAURUS* FROM SOUTH DAKOTA AND A REVISION OF THE GENUS

BY EDWIN H. COLBERT¹ AND JAMES D. BUMP²

INTRODUCTION

During the summer of 1941 Dr. Ralph Pemberton, a member of the Academy of Natural Sciences of Philadelphia, Mrs. Pemberton and Mr. E. Curzon Poultney of Gwynedd Valley, Pennsylvania, spent some time in western South Dakota, where they became interested in the numerous Mesozoic and Cenozoic exposures of that region. As a result of their interest in the paleontology of the area, they have returned each summer through 1946, and in the past half dozen years have visited nearly all of the good fossil beds within a radius of 200 miles of the Black Hills. It has been a source of much pleasure to the junior author to have made many of these trips in their company.

In July 1944 a two day excursion was undertaken to the dinosaur beds of northwestern South Dakota and it was at this time that the specimen, described in this paper, was found. Immediately after finding it Dr. Pemberton and Mr. Poultney decided that the skull should be collected and prepared for the Academy of Natural Sciences of Philadelphia and they made arrangements with the junior author to collect and partially prepare the specimen.

The skull was collected in August of the same year and preparation was begun shortly afterwards. This was carried on as far as possible at the Museum of Geology, South Dakota School of Mines and Technology, and nearly two years later the prepared sections were sent to Princeton University where final assembling and restoration was completed by Mr. Robert Witter.

Expressions of appreciation must go first to Dr. Pemberton and Mr. Poultney who made possible the collecting and preparation of the specimen. Thanks are also due to Dr. H. B. Goodell, Rapid City, South Dakota for his assistance in the field and to Mr. Ren Gardner of Harding, South Dakota, a lessee of the land on which the specimen was found, who transported the specimen by sled to where it could be reached with a truck. Lastly, we are

¹ Curator, The American Museum of Natural History, New York. Associate Curator, Academy of Natural Sciences of Philadelphia.

² South Dakota School of Mines and Technology, Rapid City, South Dakota.

obligated to Mr. Robert Witter of Princeton University for the fine work he did in the final preparation of the skull.

The photographs used to illustrate this paper were made by Mr. A. Delwin Warden of the Academy of Natural Sciences of Philadelphia. The line drawings were made by Louise Waller Germann.

Geologic and Geographic Relationships

The skull was found in the Hell Creek Formation, 108 feet below the capping Fort Union Sandstone, in a roughly eroded area known as the "Jump Off", ten miles east of Camp Crook, Harding County, South Dakota. It was lying ventral side up with parts of both maxillaries, the rostral, and the jugal and squamosal of the right side exposed. All of the clay surrounding the specimen, and for some distance away from it, was tilted on edge so that the bedding planes were vertical. This disturbance, which came after fossilization was completed, undoubtedly turned the skull over and broke it into numerous fragments, with considerable displacement of the parts, especially in the posterior portions. The bone was well preserved but the surfaces and the contacting edges of the broken pieces were coated with from a quarter of an inch to four inches of silicious limonite that made preparation exceedingly slow and tedious. The posterior fringe of the frill was badly scattered and a few small pieces were never recovered. Even so, this specimen after preparation is one of the choice ceratopsians known from North America, and it adds considerably to our knowledge of the genus *Torosaurus*.

This *Torosaurus* skull was found approximately 170 miles northeast of the locality in Niobrara County, Wyoming where, in 1891, Hatcher collected the remains of two skulls of the same genus. The geologic horizon of the two localities is nearly identical.

Description

***Torosaurus latus* Marsh**

Plates 2-5; text-fig. 1.

Acad. Nat. Sci. Phila., No. 15192, a skull. Upper Cretaceous. Hell Creek formation, about 100 feet below the contact of this formation with the Fort Union Sandstone. Ten miles east of Camp Crook, Harding County, South Dakota. July, 1944.

The new ceratopsian skull to be described below certainly belongs to the genus *Torosaurus*, and as will be shown, there is every reason to regard it as conspecific with the species *Torosaurus latus* Marsh. This specimen is so well preserved that it offers new information with regard to the structure of the skull in *Torosaurus*, and in addition it affords supplementary knowledge that enables us to view more clearly than before the genus and species to which it belongs. Therefore it is felt that a careful study of the specimen is fully justified at the present time.

The genus *Torosaurus* is a remarkably rare ceratopsian, being known at the present time by just three specimens. These are the two specimens in the Yale Peabody Museum, named by Marsh *Torosaurus latus* and *Torosaurus gladius*, and the new skull now under consideration. It is an interesting fact that these three *Torosaurus* specimens come from horizons in which ceratopsians of the genus *Triceratops* are quite abundant.

The two *Torosaurus* skulls in the Yale Peabody Museum, collected in 1891 by John Bell Hatcher, who was then working for Professor Marsh, were found rather near to each other and from the same horizon. Both skulls were found in Niobrara County, southeastern Wyoming, the one on Lightning Creek, about two miles above its confluence with Lance Creek, the other on the divide between Lightning and Cow Creeks, about a mile above the confluence of these streams with Lance Creek. Therefore the two skulls were hardly more than a mile apart, if that. Both came from near the top of the Lance formation.

Curiously enough, no other recognizable *Torosaurus* materials were found until the discovery of this new skull in 1944. This specimen came from the northwestern corner of South Dakota, from a locality about 10 miles east of Camp Crook in Harding County. This locality is about 170 miles in an airline north by east of the Wyoming locality where the first two skulls were found. The South Dakota skull was found near the top of the Hell Creek formation, which is correlative with the Lance. Thus it is evident that the three skulls were found geographically rather near together, and stratigraphically from what may be regarded as the same horizon. This has some bearing upon the relationships of the skulls to each other, as will be shown below.

The new *Torosaurus* skull is on the whole rather complete with only minor areas restored. Moreover, the two sides of the skull complement each other pretty well, so that restorations on one side can be made upon the basis of bone present on the other side. The restored portions are as follows:

Anterior portion of the rostrum. Nasal on the right side. Articular portion of the left quadrate. Most of the right quadrate. Proximal and distal portions of the parietal around the left fenestra. Small areas of the parietal around the right fenestra.

In the type of *Torosaurus latus*, Y. P. M.³ No. 1830, the following parts are restored:

Entire rostrum. Jugal and lower facial region, below the orbit. Brow horns, except for their bases. All of frill, except the left and right squamosals and the basal portion of the parietal.

³ Y. P. M.—Yale Peabody Museum.

In the type of *Torosaurus gladius*, Y. P. M. No. 1831, the following parts are restored:

Most of the skull in front of the frill. (The portions preserved are the nasal and brow horns, the orbital regions and the cranial roof, and a part of the left jugal.) Parts of the parietal, especially around the fenestrae.

The new skull has been subjected to a certain amount of lateral crushing, so that it is distorted in some of its aspects. Thus the median line of the facial region forms an angle with the median line of the frill, the anterior and posterior parts of the skull being skewed to the right with relation to each other. Moreover, the brow horns, when viewed from the front, are virtually parallel instead of divergent, and this may pretty certainly be attributed to crushing. The frill itself is very convex from side to side, again a character that may be due in part to crushing. In this connection, however, it must be said that the convex frill in this *Torosaurus* skull, resembling as it does the frill in a normal *Triceratops* skull, probably is as close if not closer to the true condition than the very flattened frills of the two Yale *Torosaurus* specimens.

As to size, the new skull is considerably smaller than the other two skulls. Linearly, the difference between the two larger skulls, which are virtually of the same size, and this smaller skull is on the order of 30 percent, which means that in bulk there is a very large difference to be seen between them. This difference in size extends to certain portions of the skull, as well as to overall dimensions. For instance, the brow horns in the new specimen are much shorter than they are in the type of *Torosaurus gladius* (the only one of the two Yale specimens in which the brow horns are preserved), while the frill also is smaller, both actually as would be expected, and relatively. The significance of these differences will be discussed below.

In the Philadelphia specimen of *Torosaurus* at the Academy the rostrum is long and rather low as it is restored. The presence of bone both above and below the narial opening, and the good preservation of the skull even in its most anterior portion makes it probable that this portion of the specimen as prepared and restored is essentially correct. Since the rostra of both of the other specimens are completely restored, no comparisons can be made.

In this connection it should be said that the narial opening in the new *Torosaurus* skull is relatively quite large. As in various other ceratopsian skulls, notably of *Pentaceratops* and of certain specimens of *Triceratops*, the nasal opening is bounded in front by a vertical bar of bone, in front of which is the comparatively small interpremaxillary foramen.

The maxilla in this specimen is rather elongated, and anteriorly it shows no visible preorbital fenestra. The preorbital fossa is obviously a variable character in the ceratopsians, being present in some specimens and absent

in others of the same species. In the type skull of *Torosaurus latus* a small preorbital fenestra is present on the right side.

For the most part sutures cannot be traced in this skull, so that the extent of individual bones must be inferred from their known relationships in other ceratopsians. On this basis it is reasonable to think that the nasal bone was rather extensive. It is certainly quite evident that the upper surface of the nasal and of the frontal as well, is very straight and horizontal, and that the nasal horn is relatively small and directed forwardly rather than upwardly as is common in the ceratopsians. This is a real condition and is not to be attributed to crushing.

The orbits are oval, with the long diameter vertical. In the type of *Torosaurus latus* the orbits are oval with the long diameter essentially horizontal, while in the type of *Torosaurus gladius* the orbits are quite large and round. These differences in shape probably are of little if any significance. It is likely that in their natural state the orbits were virtually round.

The brown horns, as said above, are relatively short in the new *Torosaurus* skull, and moreover they are essentially parallel when seen from in front. This latter character is undoubtedly due in the main to crushing, and it is to be assumed that naturally the horns would have diverged to some degree, as they do in the type of *Torosaurus gladius*. The divergence may or may not have been as great as in the Yale specimen.

As seen from the side, these horns are more anteriorly inclined than they are in the type skull of *Torosaurus gladius*, the angle with the alveolar line being about 45° as compared with an angle of 65° in the Yale specimen. This difference may be due in part to crushing, and in part it may be real. There is good reason to think that this is in large part a growth factor, as will be explained more fully below.

There can be no doubt however as to the reality of the difference in length of brow horns in the two skulls. It is interesting to see that even though these horns are much shorter both actually and relatively in the new skull than they are in the Yale specimen, they are relatively about as large at the base as in either of the Yale specimens. Therefore it seems reasonable to suppose that the shortness of the brow horns in this skull is a growth character or a sex character, or both. In this connection it should be pointed out that the brow horns arise above and behind the orbits as they do in the type of *Torosaurus latus*, not completely behind the orbits as in the type of *Torosaurus gladius*.

The jugal forms a broad bar extending down and back, and seemingly does not taper markedly towards its distal end. The small lateral temporal fenestrae are horizontally elongated as in the type of *Torosaurus latus*. The supratemporal fenestrae, as is general among the ceratopsians, are elongated

to form on either side a long opening and groove between the postorbital and squamosal laterally and the parietal medially.

A great deal of attention has been devoted to the frill in the ceratopsians, to its anatomical composition, to its ontogenetic development, and to its phylogenetic significance. This new skull resembles the two previously known skulls of *Torosaurus* in that the frill is relatively large and long. Thus the new specimen confirms the relationships assumed for *Torosaurus* by Lull, namely that it is one of the long-frilled ceratopsians and is related particularly to the genus *Pentaceratops*, of which it may be considered a derivative form. The frill is quite convex from side to side, which may be due in part to lateral crushing, and it is posteriorly quite high. It is probable that in the type of *Torosaurus latus* the parietal portion of the frill, which has been restored, is made too flat. The frill in the type of *Torosaurus gladius* is very flat, and it is to be doubted that this represents a natural condition. In short, there is every reason to think that the frill in *Torosaurus* was strongly arched from side to side and that it was very high posteriorly, just as is the case in *Pentaceratops* and in *Triceratops*.

In *Torosaurus* the squamosal is a large, blade-like bone, very broad at its base, tapering distally to a point. Its outer edge is smooth for most of its length, but proximally there are two or three very slight sinuosities. There are no epoccipitals. Its medial edge is quite distinct and it takes the form of a rounded and thickened ridge projecting above the general dorsal surface of the frill. The parietal actually fits against the under surface of the squamosal where the two bones join, and this accentuates the distinct, rounded, thickened medial edge of the squamosal. A careful comparison shows that there are no great differences in the squamosal bone in the three known skulls of *Torosaurus*.

In the new skull of *Torosaurus* the medial edge of the squamosal is bordered along its entire length by the parietal; in other words, the parietal fenestra does not reach the squamosal laterally. Marsh, in his separation of the two supposed species of *Torosaurus* that he described, made quite a point of the fact that in the type of *Torosaurus gladius* the fenestra does not reach the squamosal bone, whereas in the type of *Torosaurus latus* the squamosal presumably forms the lateral border of the fenestra. But a close examination of this latter specimen indicates that there is every reason to think that the squamosal was joined along its entire length by the parietal, just as it is in the new specimen, and presumably as it is in the type of *Torosaurus gladius*. The parietal in the type skull of *Torosaurus latus* is, except for its proximal portion, completely restored, and this restoration of the fenestra extending to the squamosal is in all probability erroneous, especially in view of the fact that the medial edge of the squamosal is roughened

along its lower surface, presumably to form a sutural edge against which the parietal made a contact. In view of these considerations there is not much doubt but that all three skulls were originally similar in the relationships of the parietal fenestra; that is, in all three skulls the fenestra was completely enclosed within the parietal. This would be in line with the condition seen in other genera of large-frilled ceratopsians, even in such forms as *Chasmosaurus* and *Pentaceratops*, in which the fenestrae are very large. The evidence afforded by the new skull of *Torosaurus* may be considered as definitive in respect to this character.

The parietal bone is quite extensive and generally very thin in the new *Torosaurus* skull, as it is in the other skulls. Mention already has been made of the fact that the frill is strongly arched—thus it is not so broad nor so flat as it is in the two Yale specimens. The parietal fenestrae are extensive, each being about half the length of the parietal bone. Since the back part of the parietal is completely restored in the type of *Torosaurus latus*, while the edges of fenestrae are for the most part restored in the type of *Torosaurus gladius* (making the shape and the exact size of the openings in this specimen largely hypothetical), no direct comparison in size and development of fenestrae between the three skulls is possible.

The median ridge of the parietal is very strongly developed in this new skull, and posteriorly there are four pronounced pits in the upper surface of the bone, two on either side of the median line.

The region of the postfrontal fontanelle is not preserved in the new *Torosaurus* skull. It will be remembered that while in the type of *Torosaurus gladius* there is the usual single postfrontal foramen, there are two distinct foramina in the type of *Torosaurus latus*. These have been figured and described in detail by Hatcher, Marsh and Lull (1907). There is no reason to think that this difference in the two specimens is of any great significance.

There is nothing in particular to say about the ventral aspect of the new *Torosaurus* skull. For the most part, the significant parts are not present.

The quadrates, as restored, are broad, and this would seem to be correct. They are depressed below the level of the alveolar border in the usual ceratopsian fashion. The condyle is a rounded ball, as is characteristic of the ceratopsians. The remainder of the basioccipital region and the brain case are not present for study.

A few teeth are preserved in the right maxilla. These seem to be of typical ceratopsian structure and development.

Table of Comparative Measurements

Torosaurus latus Marsh

	A.N.S.P. No. 15192	Y.P.M. No. 1830 ⁴	Y.P.M. No. 1831 ⁵
Greatest length of skull	1800 mm.	2560 ⁶ mm.	2600 ⁶ mm.
Length of skull, parallel to alveoli ...	1625	2430 ⁶	2600 ⁶
Length of parietal, along median line	900	1400 ⁶	1400 ⁶
Length of squamosal to lat. temp. fen.	790	1240	1430 ⁶
Preorbital length, parallel to alveoli ..	600	840 ⁶	760 ⁶
Postorbital length, parallel to alveoli	1025	1590	1840
Height, alveolar border to nasal	370	400 ⁶	....
Height, quadrate to parietal	560	600	....
Greatest breadth of squamosal	300	500 ⁶	430
Breadth of frill, over curved surface .	1240	1700	1810
Length of parietal fenestra	340	....	....
Breadth of parietal fenestra	300	....	....
Length of brow horn along lower edge	380	....	680
Circumference of brow horn at base ..	350	540	540
Vertical diameter of orbit	150	130	160
Breadth across quadrates	500 ⁶	600	....
Diameter of occipital condyle	95	....	....

Discussion

In the foregoing description an account has been given of the new *Torosaurus* skull, recently collected in South Dakota, and comparisons have been made between this skull and the two other known skulls of the genus, both in the collections of the Yale Peabody Museum. It has been shown that while there are certain differences between the three *Torosaurus* skulls, these differences are not great, and are certainly overbalanced by the resemblances that are to be seen between the specimens. Perhaps at this place a brief analysis of resemblances and differences should be set forth.

The differences between the three *Torosaurus* skulls will be considered first. As for size, between the new skull and the other two skulls, the difference, though considerable, is not thought significant since it can readily be attributed to differences in growth stages.

The difference and the type of *Torosaurus gladius* in the length of the brow horns is here considered as a growth character or a sexual difference, or possibly a combination of the two. The relatively small nasal horn in the new specimen can likewise be attributed to growth or sex differences, or both. The difference in the direction of the brown horns, as seen in lateral view, is harder to evaluate, but it probably is of individual or ontogenetic significance rather than of specific grade.

The position of the orbit in the type of *Torosaurus gladius* is slightly different from that in the other two skulls, in that it is entirely in front of

⁴ Type of *Torosaurus latus* Marsh.

⁵ Type of *Torosaurus gladius* Marsh.

⁶ Estimated measurement.

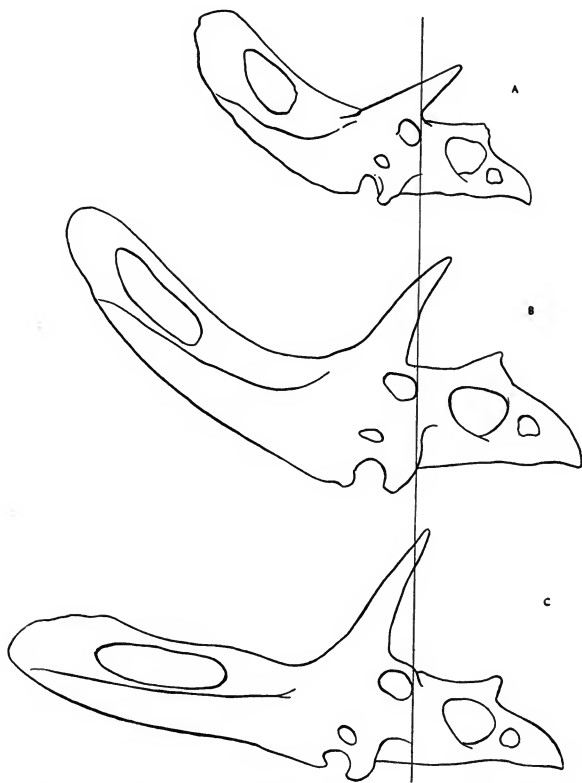


Fig. 1.—A comparison of the three known skulls of *Torosaurus latus*, as seen in lateral view and drawn to the same scale. (A) A.N.S.P. No. 15192. (B) Y.P.M. No. 1830, type. (C) Y.P.M. No. 1831, type of *Torosaurus gladius* Marsh.

the brow horn instead of being in part beneath the horn. The difference is not great.

In the type of *Torosaurus latus* there is a small preorbital fenestra, which is absent in the new *Torosaurus* skull, but from the evidence of *Triceratops* and other ceratopsians, we know that this character is variable within a species.

As for the relatively shorter frill in the new specimen as compared with the other two skulls of *Torosaurus*, we know from the evidence afforded by *Protoceratops* that there is a relative increase in the size of the ceratopsian frill with increase in ontogenetic age and consequently in size. Consequently this difference is not to be considered as significant. The differences in the shape, specifically the comparative flatness or arching of the parietal in the three specimens of *Torqsaurus* are almost certainly artificial, due to the accidents of distortion during preservation, and to some extent to restoration during preparation of the two original specimens. There is a marked difference between the types of *Torosaurus latus* and *gladius* in the post-frontal fontanelle, but this is not here regarded as a basic or significant difference.

Let us turn then to a consideration of resemblance between the three skulls of *Torosaurus*. In all aspects, the three skulls are remarkably similar. This is particularly apparent in the case of the new *Torosaurus* skull and the type of *Torosaurus latus*. These skulls, for instance, appear to be more nearly alike than are many skulls typical of the several supposed species of *Triceratops*. Therefore, if analogies are worth anything, the lesser differences between the *Torosaurus* skulls than are to be seen between skulls belonging to the several species of *Triceratops* indicate differences of less than specific magnitude in the genus under consideration.

All of the known skulls of *Torosaurus* are long frilled, and the frills are fenestrated. Except for length, the horns seem to be essentially the same in the three skulls. The squamosal is strikingly similar in these skulls, and there is every reason to think that the relationship between this bone and the parietal is identical in the three specimens. The teeth are quite similar.

Moreover, although this is not a morphologic character, the three skulls come from a fairly limited geographic area, and they all come from what is essentially a single horizon, the Lance—Hell Creek, of uppermost Cretaceous age.

In view of these considerations, the three known skulls of *Torosaurus* are hereby considered as belonging to a single species, and the genus is revised as follows:

TOROSAURUS Marsh, 1891

Marsh, O.C. 1891, Amer. Jour. Sci., 3rd ser., vol. 42, p. 266.

Generic type.—*Torosaurus latus* Marsh.

Diagnosis.—A large ceratopsian with an elongated, fenestrated frill. Brow horns large, nasal horn small. Nasal opening very large. Rostrum elongated and relatively slender. Squamosal very long and blade like; smooth along its outer edge except for three slight undulations in the anterior portion. Medial border of squamosal thickened, forming a distinct ridge at the juncture of the squamosal and the parietal. Parietal thin and arched from side to side, with large fenestra enclosed entirely within the parietal bone. No epoccipitals. Upper Cretaceous.

***Torosaurus latus* Marsh**

Torosaurus latus Marsh, 1891, Amer. Jour. Sci., 3rd ser., vol. 42, p. 266.

Torosaurus gladius Marsh, 1891, *ibid.*, pp. 266-267.

Type.—Yale Peabody Museum No. 1830, a skull.

Referred specimens.—Yale Peabody Museum No. 1831, a skull. (Type of *Torosaurus gladius* Marsh.) Acad. Nat. Sci. Philadelphia, No. 15192, a skull.

Horizon.—Lance formation, Upper Cretaceous (for the type). Hell Creek formation, Upper Cretaceous.

Locality.—Niobrara County, Wyoming, north side of Lightning Creek, about 2 miles above its confluence with Lance Creek (for the type). Near the type locality, on the divide midway between Lightning and Cow Creeks, about a mile from their confluence (for Y.P.M. No. 1831). Harding County, South Dakota, about ten miles east of Camp Crook (for Acad. Nat. Sci. Phila., No. 15192.)

Diagnosis.—Since the genus is monotypic, the diagnosis for the species is the same as that for the genus, given above.

Growth Gradients in Torosaurus

The new skull of *Torosaurus*, described and discussed in this paper, gives some clue as to proportional changes in the skull due to growth that took place in this ceratopsian genus. Unfortunately, with only three specimens at hand, this problem cannot be followed very far, but at least a certain inkling as to changes in the skull during ontogenetic growth is to be had.

The work of Brown and Schlaikjer upon the genus *Protoceratops* has shown how the frill increases in relative size during the ontogenetic growth of the individual ceratopsian. This can be established for *Torosaurus* upon a comparison of the squamosal bones, which are well preserved in the three specimens. Although the squamosal in *Torosaurus* does not extend quite to the posterior margin of the frill, it is sufficiently elongated that its use in comparing frill development is valid.

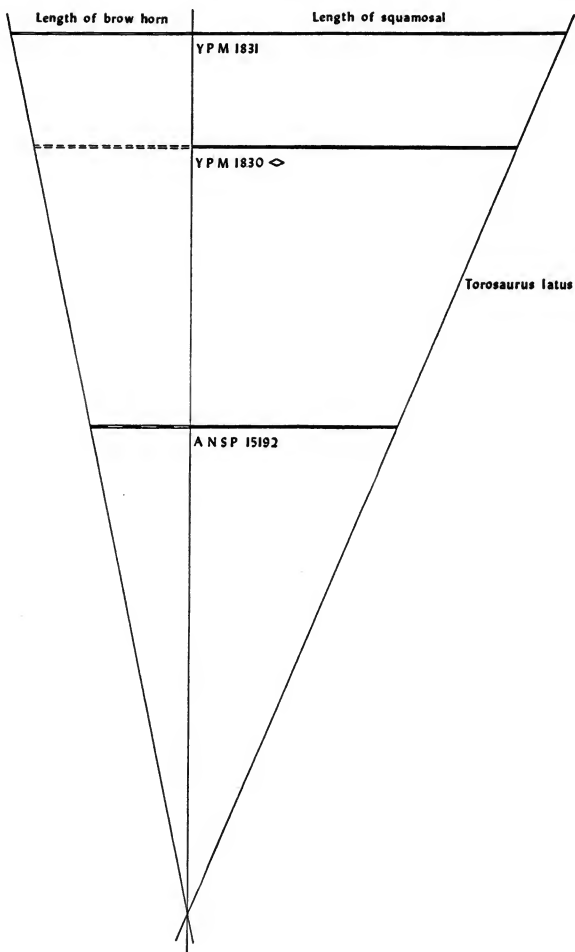


Fig. 2.—Diagram to show the relative increase during ontogenetic growth in the length of the brow horn and the length of the squamosal bone in *Torosaurus*.

As for the horns, these also show an increment in length during ontogenetic growth, although here the possibility exists that a certain amount of sexual dimorphism is involved. However, the fact that in the three specimens the bases of the brow horns are essentially alike in size would seem to indicate that probably most of the difference in horn length is to be attributed to growth. In this connection it should be pointed out that the position of the brow horns in relation to the eye, and the direction of the brow horns as seen in lateral view, may also be factors of relative growth. As can be seen from text-figure 1, the orbit is more completely under the brow horn in the smallest specimen of *Torosaurus* than it is in the two larger specimens. Moreover, there is a progressive backward shift in the base of the horn core in its relationship to the orbit in the series from the small Philadelphia specimen to the largest of the Yale specimens.

Along with this changing relationship of brow horn and orbit there is a change in the direction of the brow horn, already noted in the description and discussion, above. While the change in direction of the brow horns in the three specimens is subject at least in part to the effects of crushing, it is probably significant that in the smallest skull the brow horn is the most anteriorly directed, while in the largest skull it is the most erect. This too is shown by text-figure 1.

Other differences—the result of growth—might be outlined, but since the two original skulls of *Torosaurus* contain large areas of plaster restoration it is felt that any additional analysis is subject to a considerable degree of error. Therefore the topic is not carried beyond this point. The accompanying diagrams illustrate the points made in the above discussion.

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EXPLANATION OF PLATES

Plate 2.—*Torosaurus latus* Marsh. A.N.S.P. No. 15192, skull. Left lateral view, $\frac{1}{16}$ natural size.

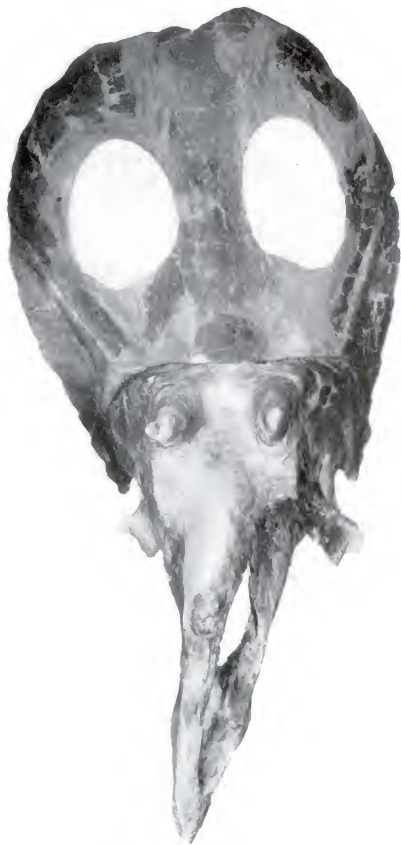
Plate 3.—*Torosaurus latus* Marsh. A.N.S.P. No. 15192, skull. Dorsal view, $\frac{1}{16}$ natural size.

Plate 4.—*Torosaurus latus* Marsh. A.N.S.P. No. 15192, skull. Anterior view, $\frac{1}{16}$ natural size.

Plate 5.—*Torosaurus latus* Marsh. A.N.S.P. No. 15192, skull. Occipital view, $\frac{1}{16}$ natural size.



COLBERT AND BUMP: TOROSAURUS SKULL



COLBERT AND BUMP: TOROSAURUS SKULL



COLBERT AND BUMP: TOROSAURUS SKULL



COLBERT AND BUMP: TOROSAURUS SKULL

NEW OR LITTLE-KNOWN COLOMBIAN BIRDS

BY RODOLPHE MEYER DE SCHAUENSEE

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The following paper endeavors to clear up certain problems connected with Colombian ornithology prior to the publication of a complete list of the birds inhabiting that Republic. This list is now completed and in the process of final revision. It is hoped that publication will take place next year.

My thanks are due to Dr. Herbert G. Deignan for the loan of certain material, including the unique pair of *Zodalia thaumasta*, and for comparing certain of my specimens with types in the United States National Museum. I am most grateful to Dr. James C. Greenway for comparing certain specimens of mine with types in the Museum of Comparative Zoölogy. Dr. W. E. Clyde Todd very obligingly lent me specimens from the collections of the Carnegie Museum. Finally, I must acknowledge a debt of gratitude to Dr. John T. Zimmer of the American Museum of Natural History for his kindness in lending the unique specimen of *Metallura purpureicauda*, *Neolesbia nehrkorni* and many other rare species, and further for comparing certain specimens with types in his charge. Without the generous cooperation of the above mentioned gentlemen most of the following studies would have been impossible.

Brother Nicéforo-María kindly sent me for examination two humming birds of the greatest interest which are discussed in the following pages.

On the genus *Zodalia*

The receipt of a strange humming bird sent to me for identification by Brother Nicéforo-María has led me to investigate the status of some very rare and little known hummingbirds of or near the genus *Zodalia* from Colombia and Ecuador. These are *Zodalia glyceria* described from near Popayán, Colombia, *Metallura purpureicauda* described from "Bogotá", *Zodalia thaumasta* described from Illalo, Chillo Valley, Ecuador, and *Zodalia ortonii* described from "Ecuador" without precise locality. The results of this study seem worth recording.

To begin with, this is the description of the bird (no. 134) sent me by Brother Nicéforo acquired by him in Bogotá about 1909: fore-crown glittering brassy green, hind crown and back dark bluish green, rump and upper tail coverts bluer; chin dusky, throat patch shaped as in *Metallura tyrianthina* but blue instead of green; breast dark bluish green, bases and edges of the feathers buffy; belly dark green, the bases of the feathers white, showing through and giving a somewhat barred appearance; tail purple, deeply forked, the outermost tail feathers 50 mm., the central ones 30 mm., wing 61 mm., exposed culmen 12.5 mm.

The shape of the throat patch is like that of *Metallura tyrianthina*, and the coloration of the breast and belly, although darker, is, in pattern, exactly as in that species. The tail is very graduated, but less so, and shorter than in *Agelaiocercus*. In wing length it is intermediate between the latter genus and *Metallura*. The bill is also intermediate in length, and perfectly straight as in those two genera. The throat of *Metallura tyrianthina* is green, the throat spot of *Agelaiocercus kingi* is purple, while that of Brother Nicéforo's bird is blue. I cannot but conclude that this bird is a hybrid between *Agelaiocercus kingi kingi* and *Metallura tyrianthina tyrianthina*, both common East Andean species, found from the Subtropical to Temperate Zones.

We now come to the more complicated *Zodalia glyceria*-*Zodalia ortonii*-*Zodalia thaumasta*-*Metallura purpureicauda* complex.

Through the kindness of Herbert G. Deignan and the authorities of the United States National Museum, and Dr. John T. Zimmer and the authorities of the American Museum of Natural History, I have been allowed to borrow the type of *Metallura purpureicauda* Hartert and the type and only known female of *Zodalia thaumasta* Oberholser.

If one should examine the type and female of the latter, one would unhesitatingly say that they represent a perfectly valid species. However, on comparing them with *Metallura purpureicauda* this impression changes radically.

Metallura purpureicauda is perhaps less mature than the type of *Z. thaumasta*. The throat patch is much less developed and the tail is shorter, as is the bill. The wing, however, is somewhat longer. I measure it about 66 mm., not 71 mm. as given by Hartert. This discrepancy is due to the shoulder being pushed up under the skin, which often happens in "Bogotá"-made skins. The type of *Z. thaumasta* has a wing of 63 mm. measured flat against the ruler, thus the difference in wing length is less than has been supposed.

In coloration they are as alike as two pins, except for the emerald green throat patch, which is fully developed in *Z. thaumasta*, and not tinged with bluish on the upper throat as in *purpureicauda*. The coloration of the tail is similar including the bluish tip to the two inner pairs of rectrices. When

held against the light both supposed species show a purplish reflection both dorsally and ventrally. The very surprising thing is, however, that *purpureicauda* has a perfectly straight bill, shaped exactly as in *Agelaiocercus*, while the male and female of *thaumasta* have a somewhat curved bill, shaped exactly as in *Lesbia*. The difference is very striking.

If one takes the two species *Lesbia victoriae* and *Agelaiocercus kingi* or *coelestis* and places them beside *thaumasta* and *purpureicauda* one begins to see points of similarity and combinations of characters. The shape of the gular patch in *thaumasta* is just as in *Lesbia victoriae*. The under parts except for a somewhat bluer green color are exactly as in that species. The tips to the central rectrices, differently colored from the rest of the feather, are common to both *Agelaiocercus* and *Lesbia*. The feathers of the crown are in color and structure exactly like an immature male *Agelaiocercus kingi*, as is the shape of the tail in *purpureicauda*.

The female of *Z. thaumasta* is perhaps even more interesting than the male in showing intermediate characters. Below, it is spotted with green as is the female of *Lesbia victoriae*, but the ground color is buff, very much as in a female *Agelaiocercus*, instead of white as in *Lesbia*. The crown of a female *Agelaiocercus* is deep blue, that of *Lesbia* green. In the female of *thaumasta* it is bluish green.

I believe it reasonable to suppose that both *Metallura purpureicauda* and *Zodalia thaumasta* are hybrids, the first between *Agelaiocercus kingi kingi* and *Lesbia victoriae*, the second between *Agelaiocercus coelestis coelestis*, which closely resembles *kingi*, and *Lesbia victoriae*. The latter is common in the Quito region, and *Agelaiocercus coelestis* has been taken within 30 miles of that town. The differently shaped bills might be explained by that of *purpureicauda* taking after *Agelaiocercus* and that of *thaumasta* after *Lesbia*.

Heretofore *Metallura purpureicauda* has been believed to be a hybrid between *Metallura tyrianthina* and *Ramphomicron microrhynchum*. It has, however, a bill longer than either, and examination of the specimens reveals no similarity to either species. The astounding fact must, however, be noted here that a male and female of *Z. thaumasta* were taken at Chillo in November, perhaps on the same day, by Walter Goodfellow, whom I knew and regarded as a most conscientious collector. The labels are in his handwriting.

Gould figures two specimens of *Zodalia glyceria* (Suppl. to Monogr. Trochil., pl. 3), a male in two positions and a female (center figure). I believe this last mentioned specimen to represent *Z. thaumasta* rather than *Z. glyceria* for it is strikingly similar to the female collected by Goodfellow, and does not show the pale outer web of the outermost rectrix which is a striking feature of *glyceria-ortoni*.

The remaining species to be dealt with is *Zodalia glyceria* of which *ortoni* is supposed to be, and probably is, the fully adult male. An examination of Gould's plates (Suppl., pl. 3, ? ♂ imm., *glyceria*, and vol. III, pl 176, ? ♂ imm., *glyceria*; Suppl., pl. 4, ♂ ad. *ortoni*) leads one to suspect that here again we are dealing with a hybrid, this time between *Lesbia victoriae* and *Ramphomicron microrhynchum*. If the supposition is correct that *ortoni* is the adult male of *glyceria*, then the sequence of plumage is as in *Ramphomicron*, the purple back of the fully adult, preceded by a green backed stage. The pale outer vane of the outermost rectrix is like that of *Lesbia*. The long graduated tail is intermediate between the two genera.

The supposed female represented on the same plate as the adult male (*ortoni*) (Suppl., pl. 4) is hard to place. It has white-tipped outer rectrices common to both females of *Ramphomicron* and *Agelaiocercus*. The fact however that Gould states, "The tail is very attractively colored for a female bird; three or four of the blue feathers are tipped with green", points rather toward the female of *Agelaiocercus*. If this guess is correct it might be possible that by reversing the sexes in the cross a differently appearing bird could be produced by the same species.

The following tables show the characters involved in the foregoing discussion of the various "species", which are most like the supposed parents. It will be noted that in the *Zodalia* type, *Lesbia* characters generally predominate on the under surface, while those of *Agelaiocercus* or *Ramphomicron* on the upper parts.

Metallura tyrianthina × *Agelaiocercus kingi*

(Brother Nicéforo Maria coll. no. 134)

	<i>Metallura tyrianthina</i>		<i>Agelaiocercus kingi</i>
Bill		×	
Shape of throat patch	×		
Breast	×		
Belly	×		
Tail		×	
Crown			×
Back			×
Upper tail coverts			×

Metallura purpureicauda

(A.M.N.H. no. 483931)

	<i>Lesbia victoriae</i>		<i>Agelaiocercus kingi</i>
Bill			×
Shape of throat patch		indefinite	
Breast	×		
Belly	×		
Tail			×
Crown			×
Back			×
Upper tail coverts			×

Zodalia thaumasta ♂

(U.S.N.M. no. 173911)

	<i>Lesbia victoriae</i>	<i>Agelaiocercus coelestis</i>
Bill	×	
Shape of throat patch	×	
Breast	×	
Belly	×	
Tail		×
Crown		×
Back		×
Upper tail coverts		×

Zodalia thaumasta ♀

(U.S.N.M. no. 173910)

	<i>Lesbia victoriae</i>	<i>Agelaiocercus coelestis</i>
Bill	×	
Shape of throat patch	×	
Breast	×	
Belly	×	
Tail		×
Crown		×
Back		×
Upper tail coverts		×

Zodalia glyceria-ortoni ♂

	<i>Lesbia victoriae</i>	<i>Ramphomicron microrhynchum</i>
Bill	×	
Shape of throat patch		×
Breast	×	
Belly	×	
Tail	×	
Crown		×
Back		×
Upper tail coverts		×

On the genus *Neolesbia*

The genus *Neolesbia* was erected by Salvin for a strange-looking hummingbird. The original specimen was found in a "Bogotá" collection and described in 1887 by Berlepsch as *Cyanolesbia nehrkorni*. Since then but two specimens have appeared and the bird is now considered by both Simon and Berlioz to be a hybrid between *Agelaiocercus* and *Thalurania*. Whether this is correct is difficult to say, but the species does have characters which are somewhat intermediate between birds of these two genera.

In a recent collection sent to me for identification by Brother Nicéforo María is a specimen of hummingbird (no. 148) which agrees in so many respects with the plate of the type of *Neolesbia* (Zeitschrift Gesam. Orn., 1888, pl. 3) that rather than add a new species or even a genus to the already long list of doubtful (? hybrid) species known from "Bogotá" I prefer to identify it with *Neolesbia*.

Brother Nicéforo's superb bird can be described as follows: point of forehead glittering ultramarine-blue, crown as far back as the eyes glittering golden green, hind crown glittering ultramarine-blue, entire dorsal surface including wing coverts lustrous, deep blue-green, upper tail coverts ultramarine-blue, purple when seen against the light; tail very long (65 mm.), the feathers much graduated, the outermost 36 mm. longer than the central ones, shining purple; chin ultramarine-blue; gular patch large, extending to the extreme upper breast, rather square at the bottom, glittering golden green, surrounded all around by lustrous ultramarine-blue; breast deep ultramarine-blue, the feathers narrowly edged with sandy buff, center of belly grayish, sides of belly ultramarine-blue with green reflections; under tail coverts whitish with a dark, narrow mesial line; under surface of tail lustrous purple; bill black, feet whitish, tarsus unfeathered.

Brother Nicéforo informs me that the specimen was purchased at Bogotá in about 1909. It has been mounted, but is in an excellent state of preservation. The measurements of the bird are as follows: wing 67.5 mm., tail 65 mm., exposed culmen 15.5 mm., perfectly straight.

Through the kindness of Dr. J. T. Zimmer I was able to examine and later to borrow the specimen at the American Museum, identified as *Neolesbia nehrkorni*. The bird does not appear fully mature, and the tail is just beginning to grow, barely protruding beyond the tail coverts. The bird in question resembles it in the following respects: color of body plumage both above and below; color of tail and under tail coverts, except that the American Museum specimen has large green discs in the center of these; color of throat patch, although in our bird this is somewhat more golden green and square at the bottom rather than pointed. It differs from the American Museum specimen in the following respects: crown glittering as described above, in the American Museum specimen lustrous dark blue; bill perfectly straight, in the American Museum specimen slightly curved, as is shown in the plate of the type of *Neolesbia*. This situation, however, is analogous to that of "*Zodalia thaumasta*" and "*Metallura purpureicauda*". In our bird the tarsus is bare (? through mounting and handling), in the American Museum specimen it is covered with buffy white feathers. The latter specimen has a patch of white on the sides of the body which is absent in ours. The measurements of the American Museum specimen are as follows: wing 61.5 mm., tail —; culmen 17 mm.

The plate of the type *Neolesbia* is rather poor. It shows, however, a tail of the same shape as our specimen, which is reproduced as dark blue rather than violet-blue as mentioned in the description. Above it is blue (greenish-steel blue in description). The crown patch is shown as blue (steel blue or water blue with a greenish mixture drawn to a point posteriorly as in *Aglaiocercus* in description). In our specimen the crown patch is rounded posteriorly and glittering golden green in the center. The throat

patch is shown as emerald green and not as extensive as in our specimen (iridescent green-blue with golden reflections in description). Below the throat is shown a bronzy area which is described as "a kind of broad golden breast band" which is totally lacking in our specimen. The rest of the under parts are shown as greenish blue (so described) but greener in the plate than our specimen. The bill is slightly curved, the tarsi feathered. The measurements given by Berlepsch are as follows: wing 63.5 mm., outer tail feathers 67.5 mm., central ones 27 mm., culmen $19\frac{1}{4}$ mm.

Were it not for the fact that I have examined *Metallura purpureicauda* and *Zodalia thaumasta* and found them to be virtually identical in coloration and pattern, but differing in the shape of the bill, I would not hesitate to describe Brother Nicéforo's bird as a new species and perhaps even a genus. However, there are so many points of similarity between our specimen and *Neolesbia* that without seeing the type it seems the wisest course to identify it as a third example of *Neolesbia*. It should be noted that both the type and the American Museum specimen have longer bills (19.25, 17 mm.) than ours (15.5 mm.).

Every effort should be made by Colombian ornithologists to endeavor to discover the true habitat of this wonderful bird and to find out if it is really a good species with a definite range. I am inclined to doubt the hybrid origin of *Neolesbia*; it somehow does not have the "look" of a hybrid. It may eventually be found to inhabit some little known valley to the north of Bogotá such as that of the Lebrija or Sogamoso where recently so many birds heretofore only known from "Bogotá" have been discovered.

Because *Neolesbia* is so rare in collections does not necessarily mean that it is rare in nature or that it is a hybrid. All one need do is to point to the case of *Hylonympha macrocerca*, one of the biggest (no less than 8.5 inches in total length), most distinct and brilliant of hummingbirds, which was described from trade skins as far back as 1873 and whose country of origin still remains a mystery. Brother Nicéforo-María with great generosity has allowed the Academy to retain his specimen of the supposed *Neolesbia* from "Bogotá". It may be identified as A.N.S.P. no. 159261.

On *Trogon personatus temperatus*

***Trogon personatus temperatus* Chapman**

This has been a little-known bird and considerable confusion appears to exist regarding its range. From my material it appears to be restricted to the Subtropical and Temperate Zones of the Central Colombian Andes and the Temperate Zone of Ecuador. Chapman for some reason gives the range of *temperatus* as the "Temperate Zone of all three ranges of the Andes in Colombia, eastern Ecuador (and Perú?)". In listing his material of *temperatus* from Colombia, only Central Andean localities are mentioned (Amer.

Mus. Novit., no. 96, p. 3, 1923) and no reference is made to specimens from Paramillo (Western Andes) or El Piñón (Eastern Andes), lumped earlier under the name of *assimilis* with Central Andean birds (Bull. Amer. Mus. Nat. Hist., 36, p. 314, 1917).

A series of 16 males from Toché (7000-7500 ft.) and Laguneta (7000-10,000 ft.) have, on the average, smaller bills and bluer heads than *personatus*, but all have the bars of the outer rectrices obsolete on the inner web. Fourteen females from the above localities have the vermiculation of the wing coverts black and white instead of black and brown.

In nine males from the Eastern Andes, seven are typical of *personatus personatus* ("Bogotá", Cachirí, Las Ventanas, Magdalena Valley), one "Bogotá" male has the tail as in *temperatus*, but the bill as in *personatus*, and a second male from Cachirí is quite typical of *temperatus*. Females have the wings vermiculated brown and black. Six males from the Western Andes have the tail pattern intermediate between *temperatus* and *personatus*, while four females all have the wing coverts vermiculated black and brown.

It may be noted that Todd (Proc. Biol. Soc. Wash., 56, p. 8, 1943) records a specimen of *temperatus* from the Central Andes and refers all birds from the Eastern Andes to *personatus*. Further Todd records four females from the Eastern Andes as having black and white vermiculations on the wings but states "they are certainly not *temperatus*", therefore one must assume that they have large bills. Perhaps the Eastern Andes are inhabited by a population tending toward *temperatus*.

The Colombian Forms of *Celeus loricatus*

Four races of *Celeus loricatus* inhabit Colombia. Two of them have remained little known and through the kindness of Dr. W. E. Clyde Todd I have been able to examine them and compare them with the other subspecies known to inhabit Colombia. Dr. J. T. Zimmer also kindly forwarded his specimens for examination. The four races and their ranges are as follows:

Celeus loricatus loricatus (Reichenbach)

Range.—Tropical Zone of the Pacific coast of Colombia from Alto Bonito and the middle Atrato southward through Nariño; the lower Cauca Valley (Puerto Valdivia). [Western Ecuador.]

Celeus loricatus mentalis Cassin

Range.—Extreme northwestern Colombia to the east side of the Gulf of Urabá (Río Juradó, Río Salaquí, Río Jampavadó; Turbo). [Canal Zone and Darien.]

Celeus loricatus innotatus Todd

Range.—Tropical Zone of the north coast from Río Sinú (Jaraquiel) to the lower Magdalena (Gamarra).

Celeus loricatus degener Todd

Range.—Known only from the Tropical Zone at the western base of the Eastern Andes in the Lebrija Valley (El Tambor, Santander).

The examination of Dr. Todd's, Dr. Zimmer's and our specimens, totaling fifty, has revealed some interesting facts.

Cassin, when describing *mentalis*, mentioned birds from Turbo and the Atrato but designated no specific bird as the type. Stone (Proc. A.N.S.P., 51, p. 32, 1899) selected the bird from the Atrato as the type, but this choice was unfortunate for it is not a specimen of *mentalis* at all, but represents *loricatus loricatus*. It is a particularly heavily barred bird which agrees perfectly with a series of *loricatus*. The ranges of *loricatus* and *mentalis* come very close together in northwestern Colombia (viz. Río Salquí, *mentalis*; Alto Bonito, *loricatus*) and Cassin's Atrato bird must have come from the northern extreme of the range of *loricatus*. The Turbo bird, however, is quite typical, in its lightly barred plumage, of *mentalis*, and as Turbo is mentioned first by Cassin in the range of the subspecies, it can be used as a restricted locality.

Innotatus is very close to *mentalis*, in fact one specimen of the latter from the Río Jampavadó (A.N.S.P. no. 148642) could pass as a perfectly good specimen of *innotatus*. The latter, however, is on the average much less heavily barred below, and somewhat less so above, than *mentalis*. *Celeus mentalis* as represented by northwestern Colombian birds, is in reality intermediate between Panamá specimens of *mentalis* and both *loricatus* and *innotatus*. Above they are somewhat more heavily barred, thus showing an approach to *loricatus*, but below they are less heavily banded, showing in this respect an approach toward *innotatus*.

C. i. degener of the interior valleys on the west slope of the Eastern Andes is a pale edition of the lightly marked *innotatus*.

The Status of *Veniliornis chocoensis*

Another little known woodpecker from Colombia is *Veniliornis chocoensis* Todd, known from the type from Murindó, Chocó, and a specimen kindly presented to this museum by Dr. Dugand from Bellavista, Río Anchicayá, just south of Buenaventura on the Pacific coast. *V. chocoensis* is perhaps related, as has been suggested by Todd, to *V. cassini*, but is so distinct that I think it should be retained as a distinct species. It resembles *cassini* in being barred with black below, but the bars are much heavier. The wing coverts are, however, quite plain, not showing a trace of the prominent pale

spots present in *cassini*. Further, in skins of *cassini* the bill is pale horn, while in *chocoensis* it is deep black.

In our Colombian collections there is a male *Veniliornis* (A.N.S.P. no. 152658) from La Morelia which I cannot place. It bears a striking resemblance to *V. chocoensis* in having the under parts banded with black, and the chest faintly, instead of deeply, washed with ochraceous-tawny. The throat is spotted with black, characteristic of *chocoensis* and *cassini*. The bill is deep black. It differs from *chocoensis* in having the upper parts greener, less golden, the black bars less heavy, the rectrices more widely barred with olive and the remiges completely barred instead of barred for the basal two-thirds of their length. It somewhat resembles *V. cassini*, but the black bars on the lower surface are broader, it has no yellow before the eye or on the nape, and does not show a trace of the prominent spots on the wing coverts. The tail is barred with olive, rather than notched with whitish. The bill is deep black instead of horn color. The bird is obviously not intermediate between *cassini* and *chocoensis* but is probably the eastern representative of the latter.

As we have but a single specimen, apparently in adult plumage, but with the skull still soft, I hesitate to describe it. It will remain an interesting problem for Colombian ornithologists to solve.

The Forms of *Campylorhynchus minor* in Colombia

***Campylorhynchus minor minor* (Cabanis)**

Two specimens sent by Brother Nicéforo-María add this subspecies to the Colombian avifauna. They were collected at Villavicencio at the eastern base of the Eastern Andes, below Bogotá.

Two other subspecies are known to inhabit Colombia. They are as follows:

***Campylorhynchus minor bicolor* (Pelzelin)**

Up to a very short time ago this distinct race has been known from about seventeen "Bogotá" trade skins. Recently Brother Nicéforo-María has found it to be comparatively plentiful in the upper Sogamoso Valley on the west slope of the Eastern Andes in southern Santander and northern Boyacá.

***Campylorhynchus minor albicilius* (Bonaparte)**

Tropical Zone of the Santa Marta region and the Magdalena Valley southward to Honda.

On Thryothorus macrurus

This supposed species, described by Allen in 1889, has long remained somewhat of an enigma, and has been known from the type only. Through the kindness of Dr. John T. Zimmer I recently examined the type, and find

that its specific character, the pattern of the tail, can be matched by other East Andean birds, and that the differences exhibited by the "*macrurus*" type of bird are merely individual. Intermediates between the barred-tailed and stripe-tailed birds (*macrurus*) are frequent, and show all degrees of intermediacy. The type, a "Bogotá" bird, agrees well with specimens from the western slope of the Eastern Andes, and as this population differs from birds from the eastern slope (*Thryothorus mystacalis amaurogaster* Chapman) and West Andean birds (*T. m. saltuensis* Bangs) the name can be used for birds from the western slope of the Eastern Andes as well as those from the Central Andes which are closest to it.

I see no reason however, why *Thryothorus mystacalis* should be retained as a distinct species, for in my opinion it is the representative in north-western South America of *Thryothorus genibarbis*.

The Colombian races of this species and their ranges are as follows:

***Thryothorus genibarbis amaurogaster* Chapman**

Range.—The eastern slope of the Eastern Andes from Norte de Santander to Cundinamarca in the Subtropical Zone.

***Thryothorus genibarbis macrurus* Allen**

Range.—The western slope of the Eastern Andes from Santander to Cundinamarca, the east and west slopes of the Central Andes, Subtropical Zone.

***Thryothorus genibarbis salutensis* Bangs**

Range.—The east slope of the Western Andes, crossing to the western slope in the dry Bitaco Valley.

A New Subspecies of *Myadestes ralioides*

Myadestes ralioides inhabiting the upper Magdalena Valley is darker and more richly colored than birds from other parts of Colombia and adjacent Venezuela. For it I propose the name of:

***Myadestes ralioides candela* new subspecies**

Type.—♂ ad., A.N.S.P. no. 156154, collected at La Candela, Huila, Colombia, September 7, 1942, by Kjell von Sneidern.

Description.—The darkest of any of the Colombian races. The entire upper surface darker and richer rufous-brown than *M. r. plumbeiceps*, the rump uniform with the back instead of deeper in color than the back as in *plumbeiceps*. Crown much browner and richer in color than in *plumbeiceps*. Throat and breast conspicuously darker gray than belly, instead of uniform gray.

Differs from *M. r. venezuelensis* by much darker and richer upper surface and by much darker gray breast and throat, which is conspicuously darker than the belly, instead of uniform with it.

Range.—Subtropical Zone at the head of the Magdalena Valley, Colombia (La Candela 1600 m., Buenavista 2300 m.).

Specimens examined.—*M. r. venezuelensis*, 9. *M. r. candelae*, 22. *M. r. plumbeiceps*, 14.

Winter records of *Vireo olivaceus forreri* Madarász

Vireo olivaceus forreri breeds on the Tres Mariás Islands off the western coast of México. In the winter, however, it leaves there and its winter range is unknown except for a single record by J. T. Zimmer of a bird marked "Ecuador".

I have two specimens from Colombia which add this subspecies to the avifauna of that Republic as a transient or winter visitor.

A male was taken by Mr. Kjell von Sneidern at La Morelia, Caquetá, on November 7, 1941 and another male taken by the same collector at Santa Cecilia, 2400 ft., west slope of the Western Andes on November 15, 1945. It is interesting to note that *forreri* occurs both to the west and east of the Andes.

The specimens have wings of 81-82 mm. The superciliary is virtually absent.

Extension of the range of *Smaragdolanus leucotis mikettae*

This race is known from only two adult males both taken in western Ecuador (Paramba, 3500 ft.; Río Blanco below Mindo).

Mr. von Sneidern secured an adult male at La Selva (7000 ft.), headwaters of the Río San Juan, western slope of the Western Andes, thus extending the range of this rare bird many miles to the northward, and adding still another species to the enormous avifauna of Colombia.

Cyclarhis gujanensis in Nariño

A juvenile specimen of *Cyclarhis gujanensis*, kindly identified by Dr. Zimmer was secured at La Guayana, Nariño, southwestern Colombia.

The known range of this species in Colombia is the Santa Marta region, and the Magdalena Valley to Honda, and the llanos east of the Eastern Andes. It is therefore most surprising to find this bird in Nariño, particularly as in western Ecuador it is found only in the southwestern portion of the Republic. Most probably it represents a new form, and Colombian collectors should make every effort to secure adult examples.

A New Form of *Cyanerpes nitidus*

The *Cyanerpes nitidus* inhabiting the Caquetá region of southeastern Colombia apparently belongs to an undescribed form.

Cyanerpes nitidus caquetae new subspecies

TYPE.—♂ ad., A.N.S.P. no. 152127, collected at Belén, 600 ft., Caquetá, Colombia, by K. von Sneider on Dec. 12, 1941.

Description.—Differs from *C. n. nitidus* (Hartlaub) of Peru by being much bluer, less purplish blue, both above and below.

Measurements of type.—Wing 53, tail 28, culmen 12 mm.

Range.—Known only from the type locality in southeastern Colombia.

Specimens examined.—*C. n. nitidus*, 5 ♂, 4 ♀, Puerto Yessup, Junín, Perú. *C. n. caquetae*, 4 ♂, 2 ♀, Belén, Caquetá, Colombia.

Remarks.—Females of *caquetae* differ from those of *nitidus*, by having the blue of the forehead and malar region purer, less purplish, blue.

A New Form of *Tangara arthus****Tangara arthus palmitae*** new subspecies

TYPE.—♂ ad., A.N.S.P. no. 73388, collected at La Palmita, Santander, Colombia, by M. A. Carriker, Jr., on August 18, 1916.

Description.—Closest in color to *Tangara arthus goodsoni* Hartert, of western Ecuador, but bill decidedly smaller (9 vs. 12 mm.), and stripes on back greener.

Differs from *T. a. aurulenta* (Lafresnaye) of Bogotá by paler, less orange, under parts; yellowish green instead of golden yellow stripes on the back; and yellower, less orange, crown.

Differs at a glance from its nearest neighbor, *T. a. sclateri* by the color of the under parts which in *sclateri* are amber brown.

Measurements of type.—Wing 76 mm., tail 46 mm., exposed culmen 9 mm.

Range.—Known only from the Lebrija Valley.

Remarks.—Dr. James C. Greenway of the Museum of Comparative Zoölogy, Cambridge, most kindly compared the series from Santander, here described as new, and a series from the upper Magdalena Valley with the type of *aurulenta*, the type locality of which is "Bogotá". He writes me, "The type of *Tangara arthus aurulenta* agrees without question with your series from La Candela. . . . It differs from your series from La Palmita in being darker below, darker and more orange on the head, and the stripes on the back are yellow rather than green. . . ."

The various subspecies of *T. arthus* found in Colombia, and their ranges, are as follows:

T. a. palmitae de Schauensee

Range.—Known only from the valley of the Río Lebrija in the vicinity of Bucaramanga.

T. a. sclateri (Lafresnaye)

Range.—Known definitely only from Contratación in the upper valley of the Río Suarez, an affluent of the Río Sogamoso. This very distinct race, the range of which is very imperfectly known, is probably confined to the valley of the Río Suarez. Its range, sandwiched between *palmitae* and *aurulenta*, leads one to wonder if perhaps it could be a color phase. The type of this subspecies is also in the Museum of Comparative Zoölogy.

T. a. aurulenta Lafresnaye

Range.—The Magdalena Valley from the latitude of Bogotá, southward to the headwaters of the river.

T. a. occidentalis Chapman

Range.—The Cauca Valley, the western slope of the Western Andes and Nariño.

Nariño birds show a slight tendency toward *goodsoni* of western Ecuador in having the stripes on the back slightly tinged with greenish instead of orange as in *occidentalis*. They do however have the small bill of the latter.

Specimens examined.—*T. a. palmitae*, 4 ♂, 4 ♀, La Palmita. *T. a. sclateri*, ♂, Contratación (collection of the Museo de la Salle). *T. a. aurulenta*, ♂, Bogotá; 0, Ibagüé; 5 ♂, 5 ♀, 1 indet., La Candela; ♀, El Isno; 2 ♀, Buenavista (Huila); 2 ♂, San Agustín. *T. a. occidentalis*, 3 ♂, 5 ♀, El Tambo; ♀, Río Munchique; 16 ♂, 6 ♀, 3 indet., La Selva; 2 ♀, Pueblo Rico. *T. a. occidentalis* > *goodsoni*, 16 ♂, 11 ♀, Ricaurte; 2 ♂, Río Perlasiví. *T. a. goodsoni*, 3 ♂, Junction of the Chanchan and Chiguancay rivers, western Ecuador.

On *Spermophila intermedia*, *schistacea* and *incerta*

Usually *Spermophila intermedia* (Cabanis) is regarded as a species distinct from the *schistacea* Lawrence group and *incerta* (Riley) is regarded as a race of the latter. I should prefer to regard *schistacea* as a subspecies of *intermedia*, and as the large and little known *incerta* occurs virtually with *intermedia bogotensis* Gilliard, in the Western Andes, it must be regarded as a distinct species.

Spermophila schistacea and *intermedia* are distinguishable only in degree and have not been taken at the same locality although *Spermophila intermedia* is recorded from the Takutu Mts. in southwestern British Guiana on the basis of a single male. Otherwise the ranges of the two supposed species do not coincide at all. I believe that this record, which is well outside of the known normal range of *intermedia*, should be confirmed by more specimens. While in New York I had the opportunity of examining the American Museum series of this group with Mr. E. T. Gilliard and I am most grateful to him for his courtesy.

The *Spermophila intermedia* group and the ranges of the various forms I would arrange as follows:

***Spermophila intermedia crissalis* (Carriker)**

Range.—Southwestern Costa Rica and Chiriquí, Panamá.

***Spermophila intermedia schistacea* Lawrence**

Range.—The Panamá Canal Zone.

***Spermophila intermedia bogotensis* Gilliard**

Range.—Western and central Colombia. On the west coast south to the Río Dagua, (Caldas), the Cauca Valley and the middle Magdalena Valley, probably between Banco and Honda.

This subspecies is virtually indistinguishable in color from *schistacea* of Panamá but is recognizable by its slightly smaller bill.

***Spermophila intermedia agustini* new subspecies**

Range.—Confined to the upper Tropical and Subtropical Zones in the upper Magdalena Valley.

TYPE.—♂ ad., A.N.S.P. no. 155554, collected at San Agustín, 1700 m., Huila, Colombia, by K. von Sneider on August 2, 1942.

Description.—Differs from *S. i. bogotensis* by its much paler coloration; the crown gray as is the back instead of slaty blackish, darker than the back; white spots at sides of neck larger and consequently more prominent.

Differs from *S. i. intermedia* by having prominent white patches at the sides of the neck which are lacking in *intermedia*, and by having a smaller, less massive bill. In the gray tone of the plumage they are similar.

Measurements of type.—Wing 58 mm., tail 46 mm., exposed culmen 9 mm.

Specimens examined.—*S. i. schistacea*, (type,¹ ♂) and an additional male.¹

S. i. intermedia, a series from the Santa Marta region Villavicencio,¹ Buenavista¹ and northern Venezuela.

S. i. bogotensis, Las Lomitas (type¹) and 14 males from Caldas,¹ Media Luna,¹ "Medellín",¹ Honda,¹ Popayán,¹ Salento, Icononzo,¹ and Chicoral.¹

S. i. agustini, ♂, La Candela; ♂, San Agustín; ♂, near San Agustín; ¹ 3 ♂, Andalucía.¹

***Spermophila intermedia intermedia* (Cabanis)**

Range.—Northern Colombia in the Santa Marta region, the lower Magdalena Valley to Algodonal, and the east slope of the Eastern Andes. Northern Venezuela south to the Orinoco. ? The Takutu Mountains, British Guiana.

¹ Specimens in the American Museum of Natural History, New York.

Spermophila intermedia longipennis (Chubb)

Range.—Southern Venezuela, the Guianas, and Peixe-Boi near Belém, Pará, Brazil.

Spermophila intermedia insularis Gilliard

Range.—The island of Trinidad.

Spermophila incerta (Riley)

Range.—Pacific slope of Colombia from the headwaters of the Río San Juan (Santa Cecilia, 2400 ft.) southward to Nariño (Mayasquér, 4500 ft.) and western Ecuador (Gualea).

This species has until recently been known from the type only, a male, according to Mr. Deignan, in very worn plumage. I sent him an immature male and a female which he most kindly compared with the unique type. Our male unfortunately has a broken bill, but although somewhat immature, shows enough of the adult plumage to make comparison possible. He writes me, "As between our one specimen of *incerta* and our one of *schistacea* your bird in every way agrees better with the former."

Incerta is much larger than *intermedia*. The wing of the type, very worn, measures 66 mm. (Deignan), of our immature male 67 mm. Two females have wings of 62.5, 63.5 mm. Our males of *bogotensis* measure 56.5, 57, 58, 59 mm., two males of *agustini* 57-58 mm., two females 53-55 mm., five males of *intermedia* from Santa Marta 56, 57, 57.5, 58, 58 mm.

Incerta closely resembles *schistacea* in coloration but the white areas of the under parts intergrade with the gray, and are not as clearly defined as in *schistacea*.

The acquisition of Colombian specimens greatly extends the range of *incerta* to the northward and shows that the northern end of its range coincides with the southern end of the range of *bogotensis* in western Colombia, (Santa Cecilia, *incerta*; Las Lomitas, *bogotensis*) and thus *incerta* will have to be regarded as specifically distinct from the *intermedia* group.

Atlapetes crassus in Colombia**Atlapetes tricolor crassus** Bangs

The only known specimen from the Cauca Valley is the type from San Antonio, on the eastern slope of the Western Andes, collected by Palmer.

We have four specimens from La Selva on the western slope of the Western Andes, and these birds are considerably blacker above, almost pure glossy black, than specimens from Nariño.

Dr. James C. Greenway was kind enough to compare our Nariño and La Selva birds with the type and surprisingly enough neither agreed with it. He writes me: "It (the type) is considerably greener, less blackish on the back than any of your specimens, and the head is brown, not yellowish

green. The feathers do not look worn . . . ; the fact is that the type is separable at a glance from any one of your birds by the brownish, not yellowish green head and the greener back, rump and upper tail coverts".

In view of the fact that only one Cauca Valley bird exists in collections, it is advisable to await more material from the Cauca Valley, and to be sure that the type of *crassus* properly represents that race and is not an aberrant individual, before describing other Colombian races.

A New Race of *Atlapetes semirufus*

Atlapetes semirufus zimmeri new subspecies

TYPE.—♂ ad., A.N.S.P. no. 73426, collected at Río Negro, Boyacá, east slope of the Eastern Andes, on April 9, 1917, by M. A. Carriker, Jr.

Description.—Differs from all other forms by the color of the back which is dark, dull, grayish green,² in color rather resembling that of the back of *Atlapetes personatus* (Cabanis) but not quite so dark.

Differs from *Atlapetes semirufus majusculus* Todd from Peña Blanca, Santander, on the opposite slope (west) of the Eastern Andes from Río Negro, by having the rufous portions of the plumage darker, especially on the breast, and by having the back much darker.

Differs from *Atlapetes semirufus semirufus* (Boissoneau), from both slopes of the Eastern Andes by having the back much darker, duller and less green; rufous of the head and particularly the breast paler and less extensive on the latter.

The Venezuela forms (*denisei*, *benedetti*, and *albigula*), of which specimens have been examined, all have green backs of quite a different shade from *zimmeri*.

Measurements of type.—Wing 79 mm., tail 80 mm., culmen 12 mm.

Range.—The eastern slope of the Eastern Andes in Boyacá, where it is known only from the type locality.

Remarks.—In New York, through the kindness of Dr. John T. Zimmer, I examined a series of *A. s. semirufus* from Bogotá, Quetame, and Choachí. Among about 15 "Bogotá" birds one had a back resembling birds from Río Negro, the rest were olive-green like birds from Choachí and Quetame. As the type of *semirufus* is a "Bogotá" bird, I felt I should be sure which of the two types it represented, so I sent my specimens to Dr. James C. Greenway who most kindly compared them with the type in the Museum of Comparative Zoölogy. He writes me: "The bird from Choachí agrees with the type of *semirufus* except that the head is rather paler than that of the type as well as another 'Bogotá' specimen. In other words, the type of *Atlapetes semirufus semirufus* is a green backed bird. Your birds from Boyacá have much darker grayish-green backs".

Named in honor of Dr. John T. Zimmer of the American Museum of Natural History.

² "Dark Olive", plate 40, of Ridgway's Color Standards.

Through the kindness of Dr. W. E. Clyde Todd I have been able to compare my six specimens of *zimmeri* with six specimens of *A. s. majusculus* from Peña Blanca, the type locality.

The Status of *Arremon conirostris* in Colombia

There are in Colombia five well-marked subspecies of *A. conirostris*. They are as follows:

A. c. tocuyensis (Todd)

A small and very distinct race, easily separable from the others by its very pale brownish olive back and whitish eye-stripe. A series measures in millimeters as follows:

7 ♂	Wing	64.5-70	5 ♀	Wing	60-64.5
	Tail	51 -55		Tail	49-53.5
	Culmen	13 -14		Culmen	12-13

Range in Colombia.—The arid La Guajira Peninsula.

I have compared this bird with series of all the known forms of *Arremon rufivirgatus* and *Arremon conirostris*. *Tocuyensis* is undoubtedly a member of the *conirostris* group for it has the black or blackish crown stripe of the latter, not the chestnut ones of *rufivirgatus*. It is paler than any other race, but this is to be expected in a bird inhabiting an arid region such as the Guajira Peninsula and adjacent arid portions of Venezuela.

These two species are usually placed in the genus *Arremonops*, *Embernagra rufivirgata* Lawrence being the type of the genus. Ridgway quite properly separated it generically from *Embernagra* but in so doing said, "In fact I have found it difficult to discover reasons for separating them generically from the latter [*Arremon*]". (Man. North Amer. Bds., ed. 2, Appendix, p. 605). Later (Bds. North and Mid. Amer., I, p. 454) he said of *Arremon*, "... closely similar in external structural details to *Arremonops*, but with pileum and sides of head black . . .", hardly enough to warrant the separation of *Arremonops*. Todd (Proc. Biol. Soc. Washington, 36, p. 35, 1923) has pointed out this fact.

A. c. conirostris Bonaparte

A certain amount of variation in color and size is noticeable within the range of this subspecies. Birds from the Sinú region on the Caribbean coast average smaller than birds from elsewhere and have the dorsal surface averaging browner, less olive, thus showing an approach to *tocuyensis*. Birds from the Santa Marta region and the lower Magdalena are somewhat larger, while birds from the central Magdalena Valley on both slopes of the Eastern Andes are the largest of all and the greenest. It seems best, however, to call them all *conirostris* as the characters are average and not well defined.

Comparative measurements from the various regions within the range of *A. c. conirostris* are as follows:

Bolívar (Puerto Zapote, Turbaco)

3 ♂	Wing	72.5-75.5	3 ♀	Wing	69.5-71
	Tail	61 -63		Tail	56 -58.5
	Culmen	13 -14.5		Culmen	13 -14

The lower Magdalena and Santa Marta regions

14 ♂	Wing	74-79	5 ♀	Wing	70 -73.5
	Tail	60-65		Tail	57 -64
	Culmen	14-15.5		Culmen	13.5-15

The middle Magdalena, and the base of the Eastern Andes below Bogotá (Sasaima, Ambalema, Buenavista, Villavicencio)

4 ♂	Wing	78-83
	Tail	64-72
	Culmen	16-16.5

Range in Colombia.—Tropical Zone along the Caribbean coast from the Sinú delta eastward to the Santa Marta region, and down the Magdalena Valley to Ambalema.

No record exists for this bird in the Cauca Valley. Birds from that region—and there is no reason why they should not exist in that region—will probably resemble those from the middle Magdalena.

A. c. inexpectatus (Chapman)

Curiously the trend to larger size is not continued as one progresses up the Magdalena Valley into the Subtropical Zone at its headwaters. Birds from this region are small, and differ from all other Colombian races by having the superciliaries and crown stripe strongly tinged with olive, instead of being pure gray. Birds from here measure as follows:

4 ♂	Wing	71 -72	♀	Wing	62
	Tail	63 -66		Tail	54
	Culmen	13.5-14		Culmen	13.5

Range in Colombia.—Known only from the Subtropical Zone at the head of the Magdalena River (Andalucía, El Isno, San Agustín).

A. c. umbrinus (Todd)

This well-marked form is distinguishable from other Colombian races by its gray breast band and throat. In size it is intermediate between lower and middle Magdalena birds.

Range in Colombia.—Recorded only from Norte de Santander (Petrólea, Río Zúlia, El Guayabal).

In the color of the under surface *umbrinus* closely resembles *centratus* Bangs of northwestern Honduras.

A. c. striaticeps (Lafresnaye)

I can find no constant character by which *A. c. chrysoma* Slater, described from Babahoyo, western Ecuador, can be distinguished from *striaticeps*. Perhaps on the average the under tail coverts are more lemon yellow, but this is by no means constant. I should call all birds from Panamá, from the Canal Zone southward, to western Ecuador *striaticeps*.

This subspecies is recognizable from all other Colombian forms by its citrine, rather than olive, back.

Measurements of specimens examined are as follows:

Panamá, east of the Canal Zone eastward to Cana and the Río Sambú.

13 ♂	Wing	76-85	16 ♀	Wing	72-82
	Tail	66-71		Tail	61-71
	Culmen	15-18		Culmen	14-16.5

Sautatá, lower Atrato Valley

2 ♂	Wing	79 (2)
	Tail	66 (2)
	Culmen	16 (1)

Western Ecuador

2 ♂	Wing	81 -82.5	3 ♀	Wing	74.5-76
	Tail	67.5-69		Tail	64 -70
	Culmen	16 (1)		Culmen	16 -17

Range in Colombia.—Known only from northwestern (Sautatá) and southwestern Colombia (Tumaco, Barbacoas, Buenavista).

NOTES ON PERUVIAN TYRANNIDAE

BY JAMES BOND

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This is the second paper * covering the Mesomyodian families as represented in the Peruvian collections of this Academy. Almost all of the specimens were obtained by Mr. Melbourne A. Carriker, Jr., a former member of the Academy's staff, who made four expeditions to Peru between 1929 and 1933 inclusive. During this period he travelled extensively in the Republic, but particularly in the mountainous areas. He obtained a high percentage of the birds previously known from the Peruvian Andes and, in addition, a number of undescribed forms, including a new genus (*Yanacea*) and species (*Myiophobus inornatus*) of tyrant flycatchers. The Academy still has a relatively poor representation of birds from the Tropical Zone of Upper Amazonia.

I must again express my appreciation of the assistance afforded me by Dr. John T. Zimmer of the American Museum of Natural History. His kindly advice and his allowing me access to specimens in that institution have greatly facilitated this study.

In my previous paper I listed many of Mr. Carriker's collecting stations. To those must be added the following:

ASILLO (13,500 ft.).—Village on automobile road over the Eastern Cordillera, between Tirapata and Huancarani, about 25 miles from Tirapata.

BAMBAMARCA (10,000 ft.).—Near Callangate.

CACHUPATA (11,000 ft.).—Between Cuzco and Cosnipata, at the commencement of the eastern wooded region. Also spelled "Cchachupata".

HUIRO (4,800 ft.).—Village in Santa Ana Valley, north of Cuzco.

LAKE PATOCANCHA (14,000 ft.).—A small mountain lake situated a few miles east of Lake Junín.

LAS QUINUAS (11,000 ft.).—A small hamlet on trail between Uchumarea and Atuén on the western slope of the Eastern Cordillera.

MUCHICA (7,000 ft.).—A farm on the upper Pisco River, on the western slope of the Western Cordillera, in the Department of Ica. Also spelled "Muchiq".

PARAMONGA (sea level).—Large sugar plantation near the mouth of the Río Pativilca, Department of Lima.

* See these Proceedings, vol. 97, 1945, pp 17-39.

SAMNE (4,500 ft.).—In valley leading up from Trujillo to Quirivilca.

SHUMBA (2,300 ft.).—A locality in the Department of Cajamarca, apparently not far from Tambillo.

SOQUÍÁN (9,000 ft.).—Hacienda on the road from Huamachuco to Chagual, overlooking the Marañón Valley.

SUCHIMÁN (500 ft.).—Hacienda 54 km. up the railway from Chimbote, on the Río Santa.

Annotated List of Species

Agriornis microptera andecola (d'Orbigny)

♂, ♀; Santa Lucía, Desaguadero. It was not until 1937 that this southern species was first recorded from Peru, when Zimmer (Amer. Mus. Novit., no. 26, 1937, pp. 1, 2) listed specimens from the Lake Titicaca region (viz. from Puno and Tirapata). The two specimens in the Academy were collected on April 29 and May 10 respectively and are both adult. They agree closely with our Bolivian specimens, except with those from the southern part of that Republic (Dept. Tarija), which are obviously referable to the nominate form. Zimmer appeared somewhat doubtful as to the status of individuals found in Peru, stating (*l.c.*, p. 1) that the species "probably is a regular winter visitor to the highlands in the neighborhood of Lake Titicaca." I think it likely, however, that this ground-tyrant is a permanent resident in southeastern Peru, and agree with Zimmer when he states (*l.c.*, p. 2) that "it is probable that it (*andecola*) breeds throughout its entire range."

Agriornis montana insolens Sclater and Salvin

10 ♂, 12 ♀; Sandomal, Quirivilca, Soquíán, Santa Clara, Yánac, Obrajillo, Cumbre de Oroya, "Rock Forest" (Lake Junín), La Galera, Pampa de los Arrieros, Asillo, Desaguadero.

It is now apparent that the range of *A. m. insolens* extends throughout the length of Peru, from the Departments of Piura and Cajamarca to the Department of Puno. This form had not previously been recorded south of the Raya Pass (Dept. Cuzco). The above series is quite uniform, with the exception of a single adult male taken at Desaguadero, near the Bolivian boundary. This specimen has a well defined dusky patch on the inner web of the outermost rectrix and thus approaches *intermedia* Hellmayr. However, two females from Desaguadero are indistinguishable from northern examples of *insolens*.

Muscisaxicola rufivertex pallidiceps Hellmayr

♂, 2 ♀; Pampa de los Arrieros. The above specimens were collected on April 21, 1931. The only adult agrees well with our extensive Bolivian

series of this form. Zimmer (*l.c.*, pp. 3-4) suggests that *pallidiceps* is merely a winter visitant from the south. This is indicated by the fact that Carriker obtained specimens of *occipitalis* at Pampa de los Arrieros at the same season of the year (April 18-20).

***Muscisaxicola rufivertex occipitalis* Ridgway**

12 ♂, 5 ♀, 0; Cajamarquilla, Bambamarca, Yámac, Obrajillo, Cumbre de Oroya, Pampa de los Arrieros, Santa Lucía, Desaguadero.

Males from southern Peru and Bolivia average decidedly larger than those from northern Peru as stated by Zimmer (*l.c.*, p. 4). Our seven adult males from extreme southern Peru, including a topotype of *occipitalis*, and four from Bolivia have wings of 112-122 mm., whereas in two from northern Peru (Bambamarca, Yámac) the wings measure 110.5-114, the Libertad individual being the larger. I cannot discern any geographical variation in color.

***Muscisaxicola juninensis* Taczanowski**

♀; "Rock Forest" (Lake Junín). This specimen is the type of "*M. tenuirostris*" Carriker (Proc. Acad. Nat. Sci. Phila., 83, 1931, p. 458). It agrees with the description of *M. juninensis* as given by Hellmayr (Field Mus. Nat. Hist., Zool. Ser., 13, pt. 5, 1927, p. 23, footnote b), but is a trifle darker above than any of our Bolivian specimens of this species.

***Muscisaxicola flavinucha* Lafresnaye**

3 ♂, 5 ♀; Quirivilca, La Galera, Aricoma, Santa Lucía. Merely a winter resident in Peru. The species breeds in southern South America. So far as I am aware Quirivilca (Dept. Libertad) is the northernmost locality whence this species has been taken. Our Peruvian specimens were collected from April 8 to June 3.

***Muscisaxicola capistrata* (Burmeister)**

5 ♂, 2 ♀, 0; Santa Lucía, Desaguadero. The above series includes the type of "*M. c. borealis*" Carriker (Proc. Acad. Nat. Sci. Phila., 83, 1931, p. 457). Like *M. flavinucha*, the present species is evidently but a winter resident in Peru. Our specimens were collected from April 24 to May 4.

***Muscisaxicola frontalis* (Burmeister)**

♂; Pampa de los Arrieros. This is the first specimen of this striking *Muscisaxicola* that has been taken in Peru. It is, furthermore, the northernmost record of this flycatcher, which breeds in southern South America. Our example was collected on April 21.

***Muscisaxicola albifrons* (Tschudi)**

8 ♂, 3 ♀; La Galera, Aricoma. Not previously recorded from as far north as the Department of Junín.

Muscisaxicola alpina grisea Taczanowski

11 ♂, 4 ♀, 0; Quirivilca, Patás, Yánae, Cumbre de Oroya, Lake Patocancha, La Galera, Huancaráni.

Adult males have wings of 119-127.5 mm., adult females 113.5-122 mm. Our Bolivian specimens have wings that measure 117.5-125 (♂), 113-120 (♀). There is no color difference.

The record of this species from Padilla, Dept. Chuquisaca, Bolivia (Bond and de Schauensee, Proc. Acad. Nat. Sci. Phila., 94, 1942, p. 340) is an error, and pertains to *M. a. cinerea*. Consequently, *M. a. grisea* is known in Bolivia only from the Departments of La Paz and Cochabamba.

Muscisaxicola alpina cinerea Philippi and Landbeck

3 ♂, ♀; La Galera, Aricoma, Santa Lucía, Desaguadero. This form is decidedly smaller and paler than *grisea*. Seven males from Peru and Bolivia in the Academy's collection have wings of 109-113 mm., while those of five females measure 104-108 mm. All individuals found in Peru are considered to be winter residents. Our Peruvian specimens are adult, and were taken from April 10 to May 16.

Muscisaxicola maculirostris maculirostris Lafresnaye and d'Orbigny

22 ♂, 12 ♀; Cajamarquilla, Patás, Cochabamba, Saposoa, Moyobamba, Arequipa, Pampa de los Arrieros, Huacamayo, La Oroya, Huancaráni, Santa Lucía, Desaguadero.

A common and widespread form. A well-marked race (*rufescens* Berlepsch and Stolzmann) inhabits the highlands of Ecuador.

Muscisaxicola fluviatilis Sclater and Salvin

♂; Desaguadero. This specimen is the type of *M. titicacae* Carriker (Proc. Acad. Nat. Sci. Phila., 83, 1931, p. 459). It is in fresh plumage (taken May 7) and is adult, not immature as previously stated by de Schauensee and me (*l.c.*, 94, 1942, p. 341).

M. fluviatilis is primarily a species of the Tropical Zone, most specimens having been taken under 3000 feet. It is surprising, therefore, to find this flycatcher at an altitude of approximately 13,000 feet, although it has previously been recorded from "Acancocha" (or "Acaricocha") a locality in central Peru at a slightly lower elevation.

In comparison with our Bolivian series and a series from Peru in the collection of the American Museum of Natural History, the Desaguadero skin has the wing-bars better defined and somewhat darker rufous; but the bird is in fresher plumage than any that I have examined from elsewhere.

Lessonia rufa oreas (Sclater and Salvin)

8 ♂, 2 ♀; Lake Junín, Upamayo, Cumbre de Oroya, Santa Lucía, Desaguadero. *L. r. oreas* ranges south to the Province of Jujuy in northwestern

Argentina. The nominate form is found along the eastern base of the Andes in the Provinces of Salta and Tucumán (Argentina), and we have specimens from Fortín Campero, in Tarija Province, Bolivia. Our other Tarija specimens, taken near San Lorenzo at elevations above 7000 feet, have been referred by de Schauensee and me to *rufa* (*l.c.*, p. 341), but are immature: I now consider that they should be placed under *oreas*, since an immature male is much paler rufous above than young males of *rufa*.

***Myiotheretes striaticollis striaticollis* (Sclater)**

5 ♂, 3 ♀, o; Leymebamba, Cochabamba, Yáñac, Obrajillo, Huacapistana.

***Myiotheretes striaticollis pallidus* Berlepsch**

2 ♂, 2 ♀; Oconeque, Santo Domingo. Zimmer has pointed out (*l.c.*, p. 16) that southern Peruvian specimens of *Myiotheretes* are referable to *pallidus*, an observation confirmed by the material before me.

***Cnemarchus erythropygius erythropygius* (Sclater)**

♂; Atuén. The recently described Bolivian race (*bolivianus* Carriker) may be distinguished by the more restricted dusky tips to the outer rectrices. With only four specimens of the species before me I cannot vouch for the constancy of this character.

***Cnemarchus rufipennis* (Taczanowski)**

4 ♂, 2 ♀; Sandomal, Atuén, Las Quinuas, Quirivilca.

***Ochthodiaeta fuscorufa* Sclater and Salvin**

o; Oconeque.

***Ochthoeca oenanthoides polionota* Sclater and Salvin**

6 ♂, 7 ♀; Quirivilca, Yáñac, Pampa de los Arrieros, Limbani, Santa Lucía, Desaguadero. Our specimens from southern Peru are intermediate between *oenanthoides* and *polionota*. Skins from Desaguadero (2), from Limbani (1) and from Pampa de los Arrieros (1) show more or less buffy tips to the greater wing-coverts; but two from Pampa de los Arrieros and a single male from Santa Lucía lack any trace of such markings. In addition, southern birds have the underparts paler than specimens from northern Peru, but not as pale as those from Bolivia. Furthermore, they are smaller, approximately equal in size to *oenanthoides*. Two males from northern Peru have wings of 91.5-92 mm.; four females from northern Peru 87-90 mm.; four males from southern Peru 83-88.5 mm.; three females from southern Peru 79.5-82.5 mm.; thirteen males (*oenanthoides*) from Bolivia 79-89 mm.; seventeen females (*oenanthoides*) from Bolivia 78-87 mm. The

largest Bolivian male is from Calacoto (Dept. La Paz), the largest female from Opleca (Dept. Potosí).

Although I have included specimens from southern Peru under *polionota*, I do so provisionally. Additional material may show that these birds represent a population sufficiently distinct from the two currently recognized, and well characterized, forms of *O. oenanthoides* to warrant recognition of a third subspecies.

Ochthoeca fumicolor brunneifrons Berlepsch and Stolzmann

6 ♂, ♀; Sandomal, Atuén, Llui, Las Quinuas, Patás, Auquimarca. A single male from Auquimarca (Dept. Junín) is indistinguishable from specimens from northern Peru.

Ochthoeca fumicolor berlepschi Hellmayr

♂; Limbani. This individual is similar to our Bolivian specimens of *berlepschi*.

Ochthoeca leucophrys piurae Chapman

2 ♂, ♀; Porculla, Samne. This is a little known flycatcher, of which only a male and female have previously been collected, both at Palambla (Dept. Piura). It resembles the Bolivian *O. l. leucophrys* (Lafresnaye and d'Orbigny), but is very much smaller, with a shorter and stubbier bill. Zimmer, when discussing the specimens in the American Museum of Natural History, stated (*l.c.*, p. 12) that, unlike other races of *leucophrys*, this form has "the entire outer web of the outer primary . . . white", but this is not so with any of our examples, which have only the outer margins of the outer webs of these feathers white. Our two males from Porculla have a maximum wing measurement of 61 and 63 mm. respectively, the female from Samne 57.5 mm.

Ochthoeca leucophrys dissors Zimmer

5 ♂, 7 ♀; Cajabamba, Cochabamba, Cajamarquilla, Soquián, Santa Clara, Yánac.

Ochthoeca leucophrys urubambae Zimmer

o; Cumbre de Oroya. This specimen resembles our series of *dissors* from northern Peru, but the bill is somewhat smaller and it is slightly paler than the majority, thus showing no approach to *interior* Zimmer, a form not represented in the Academy's collection. Dr. Zimmer states (*in litt.*) that the Cumbre de Oroya individual is probably referable to *urubambae*.

Ochthoeca leucophrys leucometopa Sclater and Salvin

4 ♂, 4 ♀; Obrajillo, Muchica. Adults have the upperparts decidedly grayer than any of our specimens of *dissors*, but juvenile individuals are virtually similar in color to adults of that northern race.

Ochthoeca rufi-pectoralis obfuscata Zimmer

7 ♂, 7 ♀, 0; El Tambo, Chira, Llui, Atuén.

Ochthoeca rufi-pectoralis centralis Hellmayr

2 ♂, 2 ♀; Patás, Yánac. The above specimens of *obfuscata* and *centralis* were examined and identified by Zimmer prior to the publication of his second paper covering this species (*l.c.*, no. 1203, 1942, pp. 14-15).

Ochthoeca rufi-pectoralis tetricialis Chapman

5 ♂, 3 ♀; Huacapistana, Auquimarca, Cachupata. The Cachupata specimen was collected by H. Whitely, and is in rather worn plumage.

Ochthoeca rufi-pectoralis rufi-pectoralis d'Orbigny and Lafresnaye

2 ♂, ♀; Limbani. Previously recorded from this locality by Zimmer (*l.c.*, no. 930, 1937, pp. 12-13).

Ochthoeca cinnamomeiventris angustifasciata Chapman

4 ♂, ♀; Leymebamba, Chira. This is a well-marked subspecies in comparison with Bolivian specimens of *thoracica*, but the above skins are not as readily separable from Junín examples. As stated by Zimmer (*l.c.*, no. 930, p. 18) it is unfortunate that the type of *thoracica* was not described from farther south.

Ochthoeca cinnamomeiventris thoracica Taczanowski

7 ♂, 3 ♀; Auquimarca, Huacapistana, Oconeque. Two males from Huacapistana (virtual topotypes of *thoracica*), have as narrow chestnut breast bands as those of *angustifasciata*, but have shorter white superciliaries. A female from Auquimarca has very broad and lengthened white superciliaries as in *angustifasciata*, but a very broad chestnut breast band. As a series the Junín birds agree more closely with our Bolivian examples than with those from northern Peru.

Ochthoeca albidiadema orientalis Chapman

3 ♂, ♀; Atuén, Llui. These skins resemble specimens of *orientalis* from Ecuador. One of two males from Llui and a female from Atuén show obsolete rufous barring on the wing-coverts. The above are the only examples of *orientalis* that have been taken in Peru.

Ochthoeca albidiadema jelskii Taczanowski

♂, 3 ♀; Palambla, Cajabamba, Patás. A male and female from Palambla agree perfectly with Zimmer's description of *jelskii* (*l.c.*, no. 930, p. 20), a form that has previously been recorded from this locality. A female from Cajabamba, in comparison with our Palambla specimens, has much more ochraceous on the posterior underparts, has the breast tinged

with buffy and the pileum sooty brown, not "fuscous black". It may not be fully adult. The Patás individual must also be referred to *jelskii*, differing from the Palambla skins merely in being somewhat more ochraceous on the posterior underparts. Its rufous back distinguishes it at a glance from any of our examples of *spodionota*. Patás was listed by Zimmer (*l.c.*) as the northernmost locality whence *spodionota* has been recorded. We have one juvenile male of the latter race from Hichuloma, Yungas of La Paz, Bolivia. It is only slightly browner above than adults, and much less brown than any of the above specimens listed under *jelskii*.

***Ochthoea pulchella similis* Carriker**

4 ♂; Leymebamba. This appears to be a well-marked form, differing from the nominate race chiefly by its paler underparts, with the throat, foreneck, breast and sides washed with grayish olive. The posterior upperparts are olive brown with but a slight chestnut tinge. I fail to note any difference in the color of the wing-bars. A specimen taken on August 30 had enlarged testes.

***Ochthoea pulchella pulchella* Sclater and Salvin**

3 ♀; Oconeque. A female from Sandillani, Yungas de La Paz, Bolivia, a virtual topotype, resembles our Peruvian specimens. These three skins have wings of 59.5-61 mm., whereas our specimens of *similis* (all males) have wings of 65.5-68 mm.

***Ochthoea diadema cajamarcae* Carriker**

♂, 3 ♀; Chira. These specimens have the underparts (in particular the abdomen) decidedly paler and duller than any of our examples of *gratiosa* (Sclater) from eastern Ecuador and from the Western Andes of Colombia.

***Sayornis nigricans angustirostris* Berlepsch and Stolzmann**

♂, 4 ♀; Leymebamba, Tamborapa, Perené, Eneñas.

***Colonia colonus niveiceps* Zimmer**

4 ♂, 3 ♀, 2 o; "Poco Tambo" (= Pucatambo), Moyobamba, Saposoa, Perené, San Juan, Eneñas, Huacamayo. An adult male from Pucatambo is a topotype.

***Nipolegus aterrimus heterogyna* Berlepsch**

6 ♂, 2 ♀; Patás, Cochabamba, Santa Clara. An immature male resembles females but is paler, much less heavily washed with ochraceous buff, on the underparts and, in addition, is much larger (wing 85.5 mm.).

***Nipolegus aterrimus anthracinus* Heine**

7 ♂, 2 ♀; Oconeque. Three specimens, labelled as immature males, are

indistinguishable from adult females. They have wings of 76.5-77.5 mm., whereas those of our females measure 72.5-77 mm.

***Knipolegus cabanisi* Schulz**

♂; Santo Domingo. Indistinguishable from adult males from southern Bolivia.

***Knipolegus poecilurus peruanus* (Berlepsch and Stolzmann)**

4 ♂, 3 ♀, 0; Chaupe, Tamborapa, Utcubamba, Huacapistana, La Oroya. There are slight color differences in the sexes as has been noted by Zimmer (*l.c.*, no. 962, p. 26). Two adult males have the wing-bands grayish and less well defined than in females, but one has just as much, and as bright, rufous on the upper tail-coverts.

***Arundinicola leucocephala* (Linnaeus)**

♂; Iquitos. The above specimen (A.N.S.P. 51185) is part of the Tristram Collection, and was taken by H. Whitely on April 14, 1878. There is a male, taken at Pebas (Dept. Loreto) by Hauxwell, in the British Museum of Natural History. I do not know of any other record of this widespread species from Peru.

***Pyrocephalus rubinus ardens* Zimmer**

♀; Río Chinchipe (1800 ft.).

***Pyrocephalus rubinus piurae* Zimmer**

♂; Suchimán. This adult male appears to be referable to *piurae*, thus extending the range of this subspecies a short distance southward from Trujillo. It has a wing of 75 mm. The bill is a little slenderer than those of our specimens of *obscurus*.

***Pyrocephalus rubinus obscurus* Gould**

♂, 2 ♀, 0; Lima, Callao. These are very old skins of little value for comparison.

***Pyrocephalus rubinus cocachacrae* Zimmer**

5 ♂, 9 ♀; Pisco, Nazca, Humay, La Punta, Arequipa. The underparts of males in the red "phase" are decidedly rosy red, not scarlet as in our males of other Peruvian races. Four of our specimens are in the melanistic "phase": one or more red feathers are present in the males.

***Pyrocephalus rubinus rubinus* (Boddaert)**

2 ♂, ♀; Huacamayo. An adult male and female are indistinguishable in every respect from specimens of *rubinus*, of which the Academy has a long series. They show hardly any approach to *major* Pelzeln, said to inhabit

southeastern Peru. The adult male has the following measurements: wing 80, tail 57, bill (exposed culmen) 12.5 mm. The female has a somewhat shorter wing and bill. The wing-measurement of the male is greater than in the majority of our males of *rubinus*, but is slightly exceeded in a specimen from Descalvados, Matto Grosso, Brazil, which has a wing of 80.5 mm. The upperparts are by no means darker than in other specimens of *rubinus*.

Ochthornis littoralis (Pelzeln)

♂, 2 ♀; El Tingo, Puerto Yessup.

Musciralla brevicauda Lafresnaye and d'Orbigny

8 ♂, 13 ♀, 0; Shumba, Cartavia, Suchimán, Lima, Callao, Paramonga, Humay, Nazca, Pisco, La Punta.

Tumbezia salvini (Taczanowski)

♂, ♀; Romero, Olmos. A rare, monotypic genus, confined to the Arid Littoral of northwestern Peru.

Tyrannus tyrannus (Linnaeus)

♂, ♀; El Tingo, Puerto Yessup. The El Tingo specimen was taken on November 11, the male, from Puerto Yessup, on January 30.

Tyrannus niveigularis Sclater

3 ♂, 3 ♀; Romero, Olmos.

Tyrannus melancholicus melancholicus Vieillot

8 ♂, 3 ♀; Palambla, Huarmey, Suchimán, Paramonga, Pisco, Perené, La Oroya, Huiro. After comparison of our Peruvian and Bolivian series of *T. melancholicus*, I find myself unable to recognize "*T. m. obscurus*" Zimmer, of which we have topotypes from Palambla. None of the characters ascribed to this race (viz. darker and grayer back, whiter centers of chin and upper throat, more grayish shading on the breast and deeper yellow of the belly) are constant. I therefore follow Hellmayr (Cat. Birds Amer., pt. 5, 1927, pp. 106-107) in referring all of our Peruvian specimens to the nominate form.

Legatus leucophaeus leucophaeus (Vieillot)

3 ♂, 3 ♀; Río Chinchipe, El Tingo, Moyobamba, Saposoa.

Sirystes sibilator albocinereus Sclater and Salvin

♂, ♀; El Tingo. The male is immature. It differs from the adult by having conspicuous ochraceous margins to the wing-coverts, and the anterior underparts are whiter. The adult female has a wing-measurement of 96.5 mm.

This species appears to be very rare in Peru. Apart from two Bolivian skins, we have no comparative material.

***Myiodynastes luteiventris luteiventris* Sclater**

♂ ; Perené. This specimen is darker above than our examples of *vicinior* Cory, from Arizona, and would thus appear to be referable to the nominate form. Both races have been recorded from Perené.

***Myiodynastes bairdi* (Gambel)**

2 ♂, 4 ♀, 0; Palambla, Romero, Olmos, Huarmey, Paramonga. The Paramonga specimen extends the range of this interesting species south to the Department of Lima.

***Myiodynastes chrysocephalus chrysocephalus* (Tschudi)**

♂, 2 ♀; Utcubamba, Santo Domingo (Inca Mine), Oconeque. These specimens average smaller than examples from Bolivia. As might be expected the Utcubamba female is the smallest of the entire series with a wing of only 104 mm. Four Bolivian females have wings of 106.5-112.5 mm.

***Megarynychus pitangua pitangua* (Linnaeus)**

♂, ♀; El Tingo, Moyobamba.

***Megarynychus pitangua chrysogaster* Sclater**

♂; La Laja. This specimen is slightly richer yellow below and somewhat darker above than our two other Peruvian skins, and has the wing-coverts conspicuously margined with rufous. It agrees perfectly with examples from Bucay (western Ecuador), identified by Chapman (Bull. Am. Mus. Nat. Hist., 55, 1926, p. 514) as *chrysogaster*, a race not previously recorded from Peru.

Hellmayr (*l.c.*, p. 133, footnote) stated that the rufous edges to the remiges are much more conspicuous in *chrysogaster* than in *pitangua*, but this character does not hold in the series of these two races before me.

***Conopias cinchoneti cinchoneti* (Tschudi)**

♂, 2 ♀; Tamborapa, Río Jelashte. The male is immature, and agrees with Zimmer's description of a young male from Baeza, Ecuador (*l.c.*, no. 963, 1937, p. 18). The two adult females closely resemble three males and a female (*icterophrys*), from the Río Munchique and from Buenavista (Huila), Colombia, but the pileum is a trifle paler and the forehead more broadly yellow, although identical in the latter respect with the Buenavista specimen, which, however, has the forehead brighter yellow than any of the Peruvian skins. Wings of our adult females from Peru measure 83-84.5 mm., that of an adult female from the Río Munchique 76 mm. Colombia males have wings of 79-83.5 mm.

Myiozetetes similis similis (Spix)

6 ♂, 5 ♀; Río Chinchipe, Tamborapa, El Tingo, Moyobamba, Eneñas, Huacamayo.

Myiozetetes similis subspecies

3 ♂; La Laja. In comparison with specimens of *grandis* from western Ecuador, these skins are similar, except that the underparts are paler, less richly yellow. They agree with *grandis* in having the external margins to the inner remiges light greenish yellow, not rufescent or brownish, and must be considered to represent a population intermediate between *grandis* and *similis*.

Myiozetetes granadensis obscurior Todd

♂, ♀; Huacamayo.

Myiarchus swainsoni ferocior Cabanis

♀; Shapaja. Although collected as late as November 18 this specimen must be referred to *ferocior*. The dull ventral coloration, dark lores, and broad pale tips to the upper wing-coverts are characters typical of this southern race.

Myiarchus phaeocephalus phaeocephalus Sclater

2 ♂, ♀; Romero. These specimens agree perfectly with two males from Chongoncito, Ecuador. Males have wings of 94-96 mm., a female 85 mm.

Myiarchus phaeocephalus interior Zimmer

3 ♂, ♀; Río Chinchipe, Tamborapa. This is a well-marked subspecies, differing from *phaeocephalus* chiefly by its browner upperparts and the deeper yellow of the posterior underparts. Our males have slightly shorter wings (90-93 mm.) than those of the nominate form, but a specimen from the Río Chinchipe, labelled as a female, has a wing of 92.5 mm.!

Unfortunately Mr. Carriker did not obtain *M. p. toddi*, an apparently very distinct form known at present only from the type taken at Palambla in the Subtropical Zone.

Myiarchus ferox ferox (Gmelin)

4 ♂, ♀; El Tingo, Saposoa, Puerto Indiana, Puerto Yessup.

Myiarchus ferox australis Hellmayr

♂; Huacamayo. This skin agrees in every respect with specimens of *australis* in the Academy's collection from Bolivia and Matto Grosso, and apparently constitutes the first record of this subspecies from Peru. The southern race is well characterized, and differs from *ferox* chiefly in having

the upperparts much paler. The mantle is dull grayish olive, instead of sooty brown with a faint olive gray tinge: the crown is grayish olive brown, the centers of the feathers darker, not uniformly blackish brown.

***Myiarchus cephalotes cephalotes* Taczanowski**

4 ♂, 3 ♀; Chaupe, Río Jelashte, Moyobamba, Utcubamba.

***Myiarchus cephalotes gularis* Zimmer**

♀; La Oroya.

***Myiarchus tuberculifer tuberculifer* (d'Orbigny and Lafresnaye)**

♀; El Tingo (1500 ft.). In Peru this form is confined to the Humid Tropical Zone.

***Myiarchus tuberculifer atriceps* Cabanis**

7 ♂, 19 ♀, 0; Chira, Tamborapa, Cajabamba, Hacienda Limón, Leymebamba, Palambla, Poreulla, Patás, Soquián, Santa Clara, Obrajillo, Auquimarea, Santo Domingo (Inca Mine), Oconeque.

***Myiarchus semirufus* Sclater and Salvin**

3 ♂, 6 ♀; Olmos, Guadalupe, Cartavia, Suchimán, Paramonga. A remarkable *Myiarchus*, confined to the Arid Tropical Zone of northwestern Peru.

***Contopus virens richardsonii* (Swainson)**

♂, 3 ♀; Moyobamba, Pucatambo, Perené, San Juan. Our Peruvian specimens of this North American migrant were taken from October 12 to January 7.

***Contopus cinereus punensis* Lawrence**

7 ♂, 2 ♀; San Ignacio, Hacienda Limón, Palambla, Cochabamba, Patás, Soquián, Muchica. Two females from Muchica are slightly darker above than the other specimens. This form has not previously been recorded as far south as the Department of Ica.

***Contopus nigrescens canescens* (Chapman)**

♂, ♀; Moyobamba. Chapman stated (Bull. Amer. Mus. Nat. Hist., 55, 1926, p. 527) that *C. nigrescens* has "no close relationship with any known species", but Hellmayr (*l.c.*, p. 197) considers it conspecific with *cinereus*. The Peruvian form *canescens* is still unknown outside of the Department of San Martín.

The female from Moyobamba is immature. It has rather broad white tips to the wing-coverts, and the feathers of the pileum, entire back, and posterior underparts are narrowly tipped with white.

Contopus fumigatus ardosiacus (Lafresnaye)

8 ♂, ♀; Leymebamba, Río Jelashte, Utcubamba, Eneñas, Huacapistana.

Contopus fumigatus zarumae (Chapman)

♂, 3 ♀; La Laja, Palambla, Porculla. I follow Zimmer (*l.c.*, no. 1042, p. 2) in allocating our specimens of this species from the western side of the Western Andes to this West Ecuador race.

Empidonax traillii traillii (Audubon)

♂, o; Puerto Yessup (Jan. 28), San Juan (Jan. 8).

Empidonax traillii brewsteri Oberholser

5 ♂, ♀, o; El Tingo (Nov. 7-11), Saposo (Oct. 31).

Empidonax euleri euleri (Cabanis)

♀; San Ignacio. This specimen, taken on July 31, agrees perfectly with the description of *euleri*. It has been known for some time that this subspecies reaches northern Peru on migration (cf. Zimmer, *l.c.*, no. 1042, pp. 2-3). The San Ignacio female has a wing of 67 mm. and is decidedly larger than any specimens of *bolivianus* in the Academy's collection. Our females of the latter have wings of 61-63.5 mm.

Empidonax euleri bolivianus Allen

2 ♂, ♀; Puerto Yessup (Feb. 3), Huacamayo (July 21). Considered by Zimmer (*l.c.*) a permanent resident in Peru. This race is an inhabitant of the Tropical Zone in northern Bolivia, whence our specimens were taken at altitudes between 825 and 2200 feet. *E. e. argentinus* breeds at rather high elevations (3500-5500 ft.) in the northern part of its Bolivian range, but is found as low as 2000 ft. in the Province of Tarija during the nesting season. Our Todos Santos specimens of *argentinus* were taken between August 7 and August 12 and are presumably winter residents.

Empidonax griseipectus Lawrence

5 ♂, 2 ♀, o; San Ignacio, Palambla, La Laja, Porculla. Two males from Palambla had enlarged testes when collected on June 24.

Mitrephanes phaeocercus olivaceus Berlepsch and Stolzmann

4 ♂, 2 ♀; Río Jelashte, Kl. 71 Pichis Trail (Dept. Junín), Eneñas, Santo Domingo, La Oroya.

Terenotriccus erythrurus signatus Zimmer

♂, ♀, o; "Peru", Puerto Indiana. Our male and female from Puerto Indiana are topotypes.

Terenotriccus erythrurus brunneifrons Hellmayr

3 ♂, 2 ♀, 0; Samiria, Puerto Yessup, La Pampa. A male from Samiria (on the Lower Marañon), taken by Whitely, appears indistinguishable from *brunneifrons* both in color and size.

Myiobius barbatus amazonicus Todd

♂; Puerto Yessup. This specimen has a wing of 64.5 mm. The tail (from bases of middle rectrices) measures 50 mm. in length.

Myiobius villosus clarus Zimmer

5 ♂, 4 ♀; Chaupe, Tamborapa, San Ignacio, Río Jelashte, Eneñas. This race is exceedingly close to *peruvianus*. Its best character is the color of the rump, which is somewhat darker and clearer yellow than in individuals from southeastern Peru. Other alleged differences are inconstant.

Myiobius villosus peruvianus Todd

2 ♂, 4 ♀; Huacamayo, La Pampa, La Oroya.

Myiobius atricaudus adjacens Zimmer

2 ♂, 4 ♀; Moyobamba, Shapaja, Perené. This is a decidedly darker bird than *M. a. portovela* Chapman, of which we have a series from Ecuador.

Myiotriccus ornatus aureiventris (Sclater)

2 ♂, 2 ♀; La Pampa.

Pyrrhomyias cinnamomea pyrrhoptera (Hartlaub)

2 ♂, 3 ♀, 0; Leymebamba, Chaupe, Chira.

Pyrrhomyias cinnamomea cinnamomea (d'Orbigny and Lafresnaye)

4 ♂, 10 ♀, 0; Auquimarca, Huacapistana, Santo Domingo, La Oroya, Oconeque. Specimens from the Department of Junín are more or less intermediate *cinnamomea* × *pyrrhoptera* (cf. Zimmer, *l.c.*, no. 1043, pp. 2-3).

Myiophobus flavicans superciliosus (Taczanowski)

♀; Leymebamba.

Myiophobus inornatus Carriker

♂; La Oroya (Type). A male from San Jacinto, Department of Cochabamba, Bolivia, is paler, more yellowish olive green on the upperparts, and yellow on the abdomen, than the type from Peru and two males from Sandillani, Department of La Paz. The four specimens have wings of 64-65.5 mm.

***Myiophobus pulcher oblitus* Bond**

2 ♂; Oconeque. A third specimen collected by Mr. Carriker is now in the collection of the American Museum of Natural History (cf. *Not. Naturae*, Acad. Nat. Sci. Phila., no. 127, 1943, p. 1).

***Myiophobus roraimae rufipennis* Carriker**

♀; La Oroya. The unique type was described as a full species, but it is apparently conspecific with *roraimae* (Salvin and Godman) from which it differs in being olive brown above (not rufous), becoming clearer olive, less brown, anteriorly. The wings and tail are approximately as in the Guiana race.

***Myiophobus cryptoxanthus* (Sclater)**

2 ♂; Moyobamba, Río Jelashte. These two specimens, both in worn plumage, are more streaked below, and are darker above, than any specimens that I have seen from Ecuador.

***Myiophobus fasciatus crypterythrus* (Sclater)**

5 ♂, 5 ♀; Romero, Cajabamba, Hacienda Limón, Chagual, Santa Clara (Río Sihuas).

***Myiophobus fasciatus rufescens* (Salvadori)**

10 ♂, 11 ♀, 2 o; Cartavia, Guadalupe, Suchimán, Paramonga, Callao, Lima, Pisco, Nazca, La Punta.

This well-marked form, of the Arid Littoral Zone, and lower Pacific slopes of the Peruvian Andes, is considered conspecific with *fasciatus* by Zimmer (*l.c.*, no. 1043, pp. 5-6).

***Myiophobus fasciatus auriceps* (Gould)**

♂, 2 ♀; Huacamayo, La Oroya.

***Hirundinea ferruginea sclateri* Reinhardt**

♂, 2 ♀; Río Jelashte, Huacapistana. Although currently regarded as two separate species, *H. ferruginea* and the more southern *H. bellicosa* are so closely allied that one suspects that they are conspecific.

***Onychorhynchus coronatus castelnaui* Deville**

2 ♀; El Tingo.

***Platyrinchus mystaceus zamorae* (Chapman)**

3 ♂, ♀; San Ignacio, Río Jelashte, Utcubamba, Eneñas.

***Tolmomyias sulphurescens aequatorialis* (Berlepsch and Taczanowski)**

♂, ♀; La Laja. These specimens agree with Ecuadorian examples of *aequatorialis* in having the underparts paler yellow and a whiter throat than

any of our specimens of *peruvianus*. The La Laja skins, however, have somewhat darker crowns than those from West Ecuador.

***Tolmomyias sulphurescens peruvianus* (Taczanowski)**

15 ♂, 2 ♀; Tamborapa, Río Jelashte, Utcubamba, Eneñas, Puerto Yessup. The bright yellow abdomen is diagnostic when compared with specimens of *aequatorialis* or *inornatus*.

***Tolmomyias sulphurescens inornatus* Zimmer**

♂; La Oroya.

***Tolmomyias assimilis clarus* Zimmer**

5 ♂, ♀; Saposoa, Shapaja, Perené, Puerto Yessup. The pale speculum and plain (not black-tipped) ear-coverts are excellent diagnostic characters serving to distinguish this flycatcher from *peruvianus* (cf. Zimmer, *l.c.*, no. 1045, 1939, pp. 1-13).

***Tolmomyias poliocephalus poliocephalus* (Taczanowski)**

3 ♂, ♀; El Tingo, Saposoa, Perené.

***Tolmomyias flaviventris viridiceps* (Sclater and Salvin)**

♂; Puerto Indiana.

***Tolmomyias flaviventris zimmeri* Bond**

8 ♂, 2 ♀; Moyobamba, El Tingo, Perené, San Juan de Perené, Puerto Yessup. A recently described form (cf. Not. Naturae, Acad. Nat. Sci. Phila., no. 196, 1947, p. 1) intermediate between *viridiceps* and *subsimilis*.

***Tolmomyias flaviventris subsimilis* Carriker**

♀; Huacamayo. This specimen and two females in the American Museum of Natural History from La Pampa are referable to the Bolivian *subsimilis*. They are brighter golden yellow (less greenish) on the underparts than examples of other Peruvian races.

***Rhynchocyclus fulvipectus* (Sclater)**

2 ♂, 3 ♀; Río Jelashte. This species was nesting in August. A female was noted as "laying" and two males as having the testes much enlarged during this month.

***Rhynchocyclus olivaceus aequinoctialis* (Sclater)**

♀; Moyobamba. This specimen agrees well with two males and a female from Bolivia. Zimmer remarks (*l.c.*, no. 1045, 1939, p. 22) that "two specimens from northern Bolivia . . . have a much paler belly and a more grayish chest", but a female from Todos Santos has the belly slightly richer

yellow than the Moyobamba individual, and the color of the chest is virtually the same in both skins.

Ramphotricon ruficauda (Spix)

2 ♂, 4 ♀; El Tingo, Puerto Yessup.

Todirostrum chrysocrotaphum chrysocrotaphum Strickland

o; "Peru" (Type). This specimen (A.N.S.P. no. 4177) has been referred to as a male (cf. Stone, Proc. Acad. Nat. Sci. Phila., 51, 1899, p. 47), but no mention is given of its sex on the label, in the Academy's catalogue, or in Strickland's original description (Contr. Orn., 1850, p. 48).

Todirostrum chrysocrotaphum neglectum Carriker

♂; Huacamayo (Type). Absence of a white loreal spot at once distinguishes *neglectum* from the nominate race.

Todirostrum calopteryx pulchellum Sclater

2 ♂, o; Huacamayo. A well-marked form, considered as conspecific with *calopteryx* of eastern Ecuador. *T. c. pulchellum* is confined to southeastern Peru.

Todirostrum cinereum sclateri (Cabanis and Heine)

♂, ♀; Romeros. The more or less white throat readily distinguishes this form from the more widespread *peruanum*.

Todirostrum cinereum peruanum Zimmer

5 ♂, 4 ♀; Tamborapa, San Ignacio, Perené, San Juan.

Todirostrum maculatum signatum Sclater and Salvin

♂; Puerto Indiana.

Todirostrum latirostre caniceps (Chapman)

3 ♂, 3 ♀; Moyobamba, Perené (Chanchamayo). I cannot assign a male and two females from Perené to *mixtum* Zimmer, of which we have a series from northern Bolivia, although Zimmer has identified a single female from Chanchamayo as that race (*l.c.*, no. 1066, 1940, pp. 8-9). *T. l. mixtum*, as represented by our Bolivian series, does not have the crown strongly suffused with gray, and the back is brighter, more yellowish, green.

Todirostrum capitale Sclater

♀; Moyobamba. This specimen constitutes the second record of *T. capitale* from Peru. The individual closely resembles two females from Ecuador, but has well-defined green patches on the sides of the breast, more pronounced dusky spotting on the upper throat, and the back is a little

brighter, more yellowish, green. There is a notation on the label that it was "laying" when collected on October 16.

Todirostrum plumbeiceps obscurum Zimmer

2 ♂, ♀, o; Santo Domingo. These specimens are topotypes. The Academy has four other specimens of *obscurum* from the Department of La Paz, Bolivia.

Euscarthmornis striaticollis obscuriceps Zimmer

♂; Moyobamba.

Euscarthmornis rufigularis (Cabanis)

♂; San Juan de Perené (Chanchamayo). The Academy also possesses a male of this exceedingly rare and aberrant species from Calabatea, Yungas of La Paz, Bolivia. There are only five recorded examples.

Euscarthmornis granadensis pyrrhops (Cabanis)

4 ♂, 4 ♀; Chaupe, Leymebamba, Levanto, Auquimarca. Our single specimen (♀) from the Department of Cajamarca (Chaupe) has the throat more extensively black than our other examples of this race.

Euscarthmornis granadensis caesius Carriker

♂; Santo Domingo (Type). When Carriker described *caesius* (Proc. Acad. Nat. Sci. Phila., 88, 1931, p. 460), he evidently compared his specimen with four Santa Marta skins (labelled "*granadensis*") in this Academy. Subsequently (*l.c.*, 97, 1945, p. 46) de Schauensee pointed out that Santa Marta individuals are referable to a well-marked form (which he named *lehmanni*), characterized chiefly by buff, instead of white, orbital ring and lores. Between 1937 and 1942 the Academy acquired specimens of true *granadensis* from various parts of Colombia, and I find that our single example of *caesius* is almost identical with these. Both races have white lores and a white orbital ring, although the black loreal bristles give this area a grayish aspect if examined casually. Again, *granadensis* and *caesius* (in addition to *lehmanni*) have an entirely green forehead. In *pyrrhops* the orbital ring, lores and rictal region are ochraceous. So far as I can discern, *caesius* differs from *granadensis* merely in having the black of the throat much more restricted posteriorly (as in *pyrrhops*), and in having the green of the upperparts a trifle duller.

It is astonishing to find the southeast Peruvian bird (*caesius*) almost identical with the widespread Colombian form (*granadensis*), but quite distinct from the other Peruvian race (*pyrrhops*), which ranges as far south as the Urubamba Valley in the Department of Cuzco.

Euscarthmornis margaritaceiventer rufipes (Tschudi)

2 ♂, 2 ♀; Perené, San Juan de Perené.

Lophotriccus pileatus pileatus (Tschudi)

8 ♂, 3 ♀; San Ignacio, Chaupe, "Poco Tambo" (= Pucatambo), Río Jelashte, Eneñas, Kl. 71 (Pichis Trail, Dept. Junín).

The present series includes the type of "*L. p. griseipectus*" Carriker (Proc. Acad. Nat. Sci. Phila., 85, 1933, p. 25). I agree with Zimmer, who has pointed out (*l.c.*, no. 1066, 1940, p. 19) that it would be inadvisable to recognize Carriker's race.

Lophotriccus pileatus hypochlorus Berlepsch and Stolzmann

3 ♂, 2 ♀; La Oroya, La Pampa, Santo Domingo (Inca Mine). The bright yellow, rather than whitish, abdomen distinguishes this race at a glance from *pileatus*.

Lophotriccus vitiosus affinis Zimmer

♂; Puerto Indiana. This flycatcher has, when in adult plumage, a distinctly yellower abdomen than *vitiosus*, the only other race of the species found in Peru.

Lophotriccus vitiosus vitiosus (Bangs and Penard)

3 ♂, 3 ♀, 2 o; El Tingo, Saposoa, Puerto Yessup.

Myiornis ecaudatus ecaudatus (d'Orbigny and Lafresnaye)

2 ♂, 2 ♀; El Tingo, Shapaja, Moyobamba. I agree with Zimmer that the short tail of "*Perissotriccus*" is not a sufficient character in itself to warrant the recognition of this group as a genus distinct from *Myiornis* (*l.c.*, no. 1066, 1940, p. 22).

Pseudotriccus pelzelni peruvianus Bond

3 ♂, ♀, o; Río Jelashte. These are, apparently, the first specimens of this species that have been taken in Peru. Included in the above series is the type of *peruvianus* (cf. Not. Naturae, Acad. Nat. Sci. Phila., no. 196, 1947, p. 2).

Pseudotriccus simplex (Berlepsch)

♀; Santo Domingo (Inca Mine). This specimen is a topotype of "*Ochthoeca keaysi*" Chapman, now regarded as a synonym of *P. simplex*, and is the second example of the species known from Peru. It resembles a topotype of *simplex* (a female from Sandillani, Yungas of La Paz, Bolivia), but has much less rufous on the forepart of the pileum, and the center of the abdomen is more extensively yellowish. However, the individual does not appear to be fully adult.

Hemitriccus flammulatus Berlepsch

7 ♂, ♀; El Tingo, Saposoa, Huacamayo. The specimens from the Department of San Martín constitute a great extension of range to the northward. Peruvian skins do not seem to differ from Bolivian examples.

Pogonotriccus ophthalmicus Taczanowski

12 ♂, 2 ♀; Chaupe, San Ignacio, Río Jelashte.

Pogonotriccus gualaquize Sclater

♂; Moyobamba. This specimen is similar to a male and female in the collection of the American Museum of Natural History, from Zamora, Ecuador.

Pogonotriccus poecilotis (Sclater)

8 ♂, 3 ♀; Chaupe, Río Jelashte, Kl. 93 (Pichis Trail, Dept. Junín). Compared with a long series from Colombia and Ecuador in the collection of the American Museum of Natural History.

Pogonotriccus orbitalis (Cabanis)

4 ♂, ♀; Moyobamba, Huacamayo, La Pampa. The Moyobamba male constitutes the northernmost record of this little flycatcher in Peru.

Phylloscartes ventralis angustirostris (d'Orbigny and Lafresnaye)

2 ♂, 3 ♀, 2 o; Utcubamba, Eneñas, Santo Domingo (Inca Mine).

Euscarthmus meloryphus fulviceps Sclater

14 ♂, 5 ♀, o; Río Chinchipe, San Ignacio, Hacienda Limón, Cochabamba, Cartavia, Suchimán, Yuramarca, Huarmey, Paramonga, Palambla, Romero, La Laja.

Pseudocolopteryx acutipennis (Sclater and Salvin)

♂ (imm.), ♀; Moyobamba.

Tachuris rubrigastra alticola (Berlepsch and Stolzmann)

6 ♂, 4 ♀; Upamayo, Desaguadero. This series includes the type of "*grandis*" Carriker, from Desaguadero, Lake Titicaca (Proc. Acad. Nat. Sci. Phila., 83, 1932, p. 463).

Tachuris rubrigastra libertatis Hellmayr

2 ♂, 2 ♀; Végeta, Pisco. The plumage of these specimens, collected in February, is considerably worn. *T. r. libertatis* is a very well-marked race, confined to the Peruvian Littoral.

Spizitornis parulus aequatorialis (Berlepsch and Taczanowski)

8 ♂, 8 ♀; Chira, Atué, Levanto, Capiánilla, Patás, Auquimarca, Hua-

capistana, Limbani. The Academy also has good series of this subspecies from Ecuador and Bolivia.

Spizitornis flavirostris huancabambae Chapman

♂; Cochabamba.

Spizitornis flavirostris arequipae Chapman

♂; Obrajillo.

Spizitornis reguloides nigrocristatus (Taczanowski)

11 ♂, 7 ♀; Chota, Cajabamba, Cochabamba, Patás, Cajamarquilla, Huamachuco, "Jalca" de Soquían, Santa Clara, Yámac.

Spizitornis reguloides albiventris Chapman

9 ♂, 12 ♀, 0; Huarmey, Obrajillo, Paramonga, Nazca, Humay, Huancano, Muchica.

Spizitornis reguloides reguloides (d'Orbigny and Lafresnaye)

5 ♂, 2 ♀, 0; La Punta (Tambo Valley), Arequipa.

The three adult males, taken in April, have the abdomen tinged with yellow. Females, however, have white bellies, as have all our specimens (male and female) of *albiventris*, many of which were collected at approximately the same period of the year.

Yanacea alpina alpina Carriker

♂, ♀; Yámac. The male is the type of this interesting flycatcher, which is evidently related to the genus *Spizitornis*. It closely agrees with *Spizitornis* in structural characters, but has a very distinctive color pattern.

Yámac proved a very profitable collecting ground. In addition to the present bird, Mr. Carriker obtained two other species new to science at this locality—*Leptasthenura yanacensis* Carriker and *Xenodacnis petersi* Bond and de Schauensee. The former is very distinct and should not, perhaps, be included in the genus *Leptasthenura*.

The Bolivian race *Y. a. boliviana* Carriker, known from a single female, is but slightly different from a female of the nominate form, but is almost certainly valid (cf. Proc. Acad. Nat. Sci. Phila., 94, 1941, pp. 351-352).

Serpophaga cinerea cinerea (Tschudi)

7 ♂, 2 ♀; Tamborapa, Utcubamba, Lima, Obrajillo, Auquimarca, La Oroya. I take this opportunity to point out that *Serpophaga subcristata* (Vieillot) and *S. inornata* Salvadori are distinct species, not conspecific as believed by Gyldenstolpe (Kungl. Sv. Vet. Akad. Handl., Band 23, N:o 1, 1945, p. 223), a fact demonstrated by Hellmayr (Cat. Birds Amer., pt. 5, 1927, p. 384). This Academy has both species from Todos Santos (1000

ft.), in the Department of Cochabamba, Bolivia, although we do not have a specimen of *inornata* from Fortín Campero (Dept. Tarija) as recorded by de Schauensee and me (Proc. Acad. Nat. Sci. Phila., 94, 1941, p. 352).

***Mecocerculus leucophrys brunneomarginatus* Chapman**

3 ♂, 5 ♀; Atuén, Patás, Huacapistana, Auquimarca.

***Mecocerculus leucophrys rufomarginatus* (Lawrence)**

5 ♂, ♀; El Tambo.

***Mecocerculus leucophrys pallidior* Carriker**

2 ♂, 3 ♀; Yánac. This series includes the type of this isolated and rather puzzling race. The four paratypes have been examined, and commented upon, by Zimmer (*l.c.*, no. 1095, 1940, p. 16).

***Mecocerculus leucophrys leucophrys* (d'Orbigny and Lafresnaye)**

♂, 2 ♀; Limbani, Oconeque.

***Mecocerculus stictopterus stictopterus* (Sclater)**

3 ♂, 4 ♀; El Tambo, Palambla, Leymebamba, Atuén. The Piura specimens are browner, much less green, on the upperparts than any of our specimens of *taeniopterus*. The two examples (both females) from the Department of Amazonas are intermediate between *stictopterus* and *taeniopterus*.

***Mecocerculus stictopterus taeniopterus* Cabanis**

3 ♂, 5 ♀; Patás, Auquimarca, Huacapistana. A male and female from Patás (Dept. Libertad) appear identical with the rest of the series from the Junín region. A male from San Cristobal, Department of Cochabamba, Bolivia, is greener above than any of our Peruvian examples, and the pileum is a clearer gray. It may represent an undescribed subspecies.

***Mecocerculus poecilocercus* (Sclater and Salvin)**

4 ♂; Palambla.

***Mecocerculus hellmayri* Berlepsch**

♂; La Pampa. This is the only specimen of *M. hellmayri* that has been collected in Peru. It differs from Bolivian specimens in having the white superciliary less extensive, in particular anterior, and the lores are darker.

***Mecocerculus calopterus* (Sclater and Salvin)**

2 ♂, 4 ♀; Porculla, Río Jelashte. We have no material from Ecuador with which to compare these specimens.

***Elaenia flavogaster semipagana* Sclater**

4 ♂, 4 ♀; Tamborapa, Río Chinchipe, El Tingo, Moyobamba.

***Elaenia albiceps diversa* Zimmer**

2 ♂, ♀, 0; Cochabamba (6500 ft), Santa Clara (12,000 ft.). The Santa Clara specimen, an adult of questionable sex, was collected on April 5. It closely resembles examples of *modesta*, but the wing-bands are more pronounced, with the pale tips to the greater wing-coverts much as in *albiceps*. In addition, the lores are somewhat paler. It is very different from *griseigularis* Sclater, of which we have a series from western Ecuador.

Three Cochabamba skins were taken on June 13. One male is immature, the other adult. The latter is recorded as having had the testes much enlarged, and is in very worn plumage, the pale wing-bars obsolete. White wing-bars, are, however, still evident in the female, although much abraded, particularly on the greater wing-coverts. The young bird has conspicuous rufescent wing-bars and pale outer webs to the innermost tertials.

All of the above skins are referred tentatively to *diversa*, with which they have been compared.

***Elaenia albiceps modesta* Tschudi**

17 ♂, 13 ♀; Río Jelashte, Moyobamba, Cartavia, Suchimán, Perené, Nazca, Pisco, La Punta (Tambo Valley). This form breeds in the Arid Tropical Zone of the coast of Peru, migrating into the interior of that country at the commencement of the annual *garua* or mist (cf. Zimmer, *l.c.*, no. 1108, 1941, pp. 9-10). Our specimens from the Arid Littoral of Peru were taken from March 3 to May 22, those from other localities from August 10 to December 30. Individuals in breeding condition were collected in March. The specimen taken on December 30 is an adult male from Perené and was not in breeding condition at that time.

What information we now have concerning *modesta* indicates that it is conspecific with the *albiceps* group.

***Elaenia albiceps albiceps* (d'Orbigny and Lafresnaye)**

2 ♂, 3 ♀; Oconeque, Limbani, La Oroya. I take this opportunity to record a male *Elaenia a. chilensis* Hellmayr, from Bucay, Province of Guayas, Ecuador, in the possession of the Academy (Rhoads' Collection). The individual agrees well with the description of this race, which is notable in having the outermost (tenth) primary usually longer than the fifth, a character very evident in the example before me. It was taken on June 28.

***Elaenia gigas* Sclater**

3 ♂, ♀; El Tingo, Moyobamba, Perené.

***Elaenia chiriquensis albivertex* Pelzel**

8 ♂, 7 ♀, 0; Tamborapa, San Ignacio, Chira, Moyobamba, El Tambo, Utcubamba, San Juan (Chanchamayo).

Elaenia obscura obscura (d'Orbigny and Lafresnaye)

4 ♂, 2 ♀; Tamborapa, Chira, Huacapistana, Eneñas, Huiro (north of Cuzco).

Elaenia pallatangae intensa Zimmer

4 ♂, 5 ♀; Chira, Leymebamba, Auquimarca.

Myiopagis gaimardii gaimardii (d'Orbigny)

♀; Perené. Compared with a series of *gaimardii* from Bolivia.

Myiopagis subplacens (Sclater)

3 ♂, 3 ♀; La Laja, Romeros, Palambla.

Sublegatus modestus modestus (Wied)

o; Huacamayo. Resembles Matto Grosso specimens.

Phaeomyias murina tumbezana (Taczanowski)

♂, 2 ♀; Palambla, Porculla. These birds have slightly darker (less brown) upperparts than the majority of specimens listed under *maranonica*, and the throat is slightly grayer, less whitish.

Phaeomyias murina maranonica Zimmer

8 ♂, 3 ♀, 2 o; San Ignacio, Río Chinchipe, Hacienda Limón, Patás. Much nearer to *tumbezana* than any other race.

Phaeomyias murina wagae (Taczanowski)

6 ♂, 2 ♀; El Tingo, Moyobamba, San Juan, Perené. This race is much yellower below than any other subspecies of *P. murina* found in Peru.

Phaeomyias murina inflava Chapman

7 ♂, 6 ♀; Romeros, Olmos, Cartavia, Chimbote, Suchimán. This form is readily distinguishable from other Peruvian races of *murina* by the brownish anterior underparts, and white or whitish (not yellow or yellowish) abdomen.

Phaeomyias leucospodia leucospodia (Taczanowski)

♀; Romeros.

Camptostoma obsoletum sclateri (Berlepsch and Taczanowski)

2 ♂; Romeros. These two specimens agree well with a series of *sclateri* from western Ecuador.

Camptostoma obsoletum maranonicum Carriker

9 ♂, 3 ♀, o; Cajabamba, Río Chinchipe, Hacienda Limón, Cochabamba, Soquián, Santa Clara (Río Sihuas). The type, included in the above series, is an adult male from Santa Clara.

Camptostoma obsoletum griseum Carriker

6 ♂, 5 ♀; Olmos, Samne, Cartavia, Huarmey, Yuramarca, Suchimán, Paramonga. The type is a male from Suchimán.

Phylomyias griseiceps pallidiceps Zimmer

♀; Moyobamba. This individual, in rather worn plumage, agrees well with Zimmer's description.

Tyranniscus nigro-capillus nigro-capillus (Lafresnaye)

♀; Chira.

Tyranniscus cinereiceps (Sclater)

♂; Río Jelashte.

Tyranniscus uropygialis (Lawrence)

♂, ♀; El Tambo. The male is immature. It differs from the adult female in being brown, not dark olive green, above, with the upper tail-coverts bright ochraceous. The underparts are whitish, marked with ochraceous buff, with no greenish or yellow as in the adult.

Tyranniscus chrysops flavidifrons (Sclater)

2 ♂, ♀; Palambla. These specimens are obviously referable to *flavidifrons*, a race that has not, apparently, been recorded from Peru. Its occurrence in northwestern Peru was anticipated by Zimmer (*l.c.*, no. 1109, 1941, p. 20).

Tyranniscus chrysops chrysops (Sclater)

2 ♂, 2 ♀; Poco Tambo (= Pucatambo), Río Jelashte. These skins differ strikingly from our Palambla specimens. The upperparts are lighter, and clearer green, the forehead is purer and brighter yellow, and the underparts much more heavily washed with yellow.

Tyranniscus viridiflavus (Tschudi)

♂, 2 ♀; San Juan, Eneñas.

Tyranniscus gracilipes gilvus Zimmer

4 ♂, 2 ♀; Huacamayo, La Pampa.

Tyranniscus cinereicapillus (Cabanis)

2 ♂, ♀; San Juan (Chanchamayo). In life these specimens had the lower mandibles "purplish blue" or "purplish flesh", not "leaden" or "leaden blue" as in our examples of *T. g. gilvus*. The feet of our specimens of *cinereicapillus* were recorded as "dark leaden" or "leaden black", those of *gilvus* as "leaden".

Oreotriccus plumbeiceps (Lawrence)

3 ♂, 3 ♀; San Ignacio, Río Jelashte, Eneñas. Two males from Eneñas are duller below (more greenish, less clear yellow) than specimens from more northern localities.

Tyrannulus elatus (Latham)

♂, 2 ♀; Puerto Indiana, Moyobamba. A flycatcher (A.N.S.P. no. 80675) taken at Pinheiro, near Belém, Brazil, was erroneously identified as this species (Stone, Proc. Acad. Nat. Sci. Phila., 80, 1928, p. 170). The specimen is referable to *Tyranniscus g. acer*.

Ornithion inerme Hartlaub

♀; Shapaja (Río Huallaga). This specimen is the type of "*Microtriccus fasciatus*" Carriker (Proc. Acad. Nat. Sci. Phila., 86, 1934, p. 328). I have compared the skin with examples of *O. inerme* in the collection of the American Museum of Natural History.

Leptopogon superciliaris superciliaris Tschudi

3 ♂, 2 ♀; San Ignacio, Moyobamba.

Leptopogon superciliaris intermedius Carriker

5 ♂; Eneñas. These specimens, including the type of *intermedius*, are intermediate between *superciliaris* and *albidiventer*, but are readily distinguishable. I consider *intermedius* a perfectly valid subspecies.

Leptopogon superciliaris albidiventer Hellmayr

7 ♂, 2 ♀; La Pampa, La Oroya, Santo Domingo. These specimens agree with our Bolivian series of *albidiventer*.

Leptopogon amaurocephalus peruvianus Sclater and Salvin

♂, ♀; Puerto Yessup, La Pampa.

Leptopogon taczanowskii Hellmayr

5 ♂, 5 ♀; Río Jelashte, Utcubamba.

Mionectes striaticollis palamblae Chapman

8 ♂, 6 ♀, 0; Tamborapa, San Ignacio, Chira, Palambla, Utcubamba, Leymebamba, Río Jelashte. This series includes the type of "*M. s. flaviventris*" Carriker (Proc. Acad. Nat. Sci. Phila., 86, 1934, p. 329).

Mionectes striaticollis poliocephalus Tschudi

3 ♂, ♀; Huacapistana, Eneñas.

Mionectes striaticollis striaticollis (d'Orbigny and Lafresnaye)

4 ♂, 6 ♀; La Oroya, Oconeque, Santo Domingo.

Mionectes olivaceus fasciaticollis Chapman

3 ♂, ♀; Moyobamba, Huacamayo, La Oroya.

Pipromorpha oleaginea maynana Sztolcman

3 ♂, 2 ♀; Moyobamba, Shapaja, Puerto Yessup.

Pipromorpha oleaginea chloronota (d'Orbigny and Lafresnaye)

♂; Huacamayo. Similar to two Bolivian examples from Todos Santos and Palmar (Dept. of Cochabamba). All three are slightly paler ochraceous below than our other Peruvian skins.

Pipromorpha macconnelli peruana Carriker

♀; Perené (Type). This is a juvenile specimen and has been commented upon by Zimmer, who had two additional examples (both adults) from Peru (*l.c.*, no. 1126, 1941, pp. 14-16).

SOME HITHERTO UNDESCRIBED SCROPHULARIACEAE OF THE PACIFIC STATES

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In no other part of the World are the plants of the family Scrophulariaceae so numerous and so diversified as in the western United States. Six genera, *Penstemon*, *Mimulus*, *Castilleja*, *Cordylanthus*, *Orthocarpus* and *Collinsia*—none with fewer than twenty species—have here their main or sole development. Various smaller genera, *Mohavea*, *Tonella*, *Synthyris*, and *Besseyia*, are here endemic, or have single species elsewhere in temperate North America. All these together, comprising some four hundred species in the western United States, with another hundred on our continent beyond this area, emphasize the distinctness and botanical importance of the Nearctic Realm of life. With these genera of the New World occur representatives of the dominantly Palaearctic genera, *Scrophularia*, *Antirrhinum*, *Linaria*, *Veronica*, *Rhinanthus*, *Pedicularis*, and *Melampyrum*. A third element, represented by *Bacopa*, *Stemodia*, *Asarina*, and *Galvezia*, show simple or remarkable relationships with species of warmer North America and South America.

Not only are the geographic contacts of the flora of western temperate North America notable, but within the western United States the patterns of specific distribution are surprisingly restricted and of the groups of species often surprisingly intricate. In contrast to the wide specific ranges prevalent over most of the eastern half of the continent, if we except a small number of singularly adaptable plants, the ranges of western Scrophulariaceae are precise and highly localized. In spite of the keen work of the past seventy years, it is quite natural that there should still remain species new to science. The analysis of this western flora presents a fascinating taxonomic study upon which I have been long engaged, a study to be presented in a future monograph of the Academy to be entitled "The Scrophulariaceae of the Western United States".

The plan of this study is to be that adopted in "The Scrophulariaceae of Eastern Temperate North America", published in 1935 as Monographs No. 1 of this Academy. It will be similarly a taxonomic study upon a geographical basis. The territory is equally natural, since the northwestern border of the United States is about that of the southern limit of continental

glaciation, while its southwestern border lies north of the highlands of Mexico and south of the mountain areas of our West.¹ I am making the same effort to see growing as many species as possible, to make descriptions and observations upon them, and to collect ample material for distribution to various herbaria. Later, I hope to study material in many herbaria, so as to prepare detailed maps of distribution. All this is a task of years, an undertaking that can not be completed for several seasons more.

Field-study of so extensive a type has only been possible by the generous assistance of various organizations. In 1915, on behalf of the New York Botanical Garden, I visited the central Rocky Mountain region, and in 1920 published the first part of an account of the "Scrophulariaceae of the Central Rocky Mountain States".² In 1931, with the aid of a grant from the National Research Council, I worked in the northwestern United States, and subsequently, in advance of the monographic review to come, published revisions of *Synthyris* and *Besseyia* and also presented species in some other genera.³

In 1937, with a grant from the American Philosophical Society, I was again in the northwestern states, visiting areas supplemental to those previously seen and taking advantage of a far more favorable season.⁴ In 1938, with further assistance from the American Philosophical Society, I visited the Colorado Valley and adjacent Great Basin, and also collected on the high mountains of Montana.⁵ Finally, in 1940 and again with help from

¹ The Mexican plateau with its various mountain ranges called Sierra Madre is validly a part of western temperate North America, and precludes using for my proposed account of the species of the western United States a title matching that of my eastern monograph. The highlands of Mexico depend for their vegetation nearly wholly upon summer and autumn rainfall, and so contrast climatologically as well as floristically with those of the western United States which depend mainly upon winter snowfall. The Scrophulariaceae of Mexico southeastward to the Isthmus of Tehuantepec is to constitute a distinct monograph.

² In Contributions from the United States National Herbarium, 20: 313-381. Treats especially the genus *Penstemon*. The text for the remaining genera was prepared but never published due to my desire to give further study to *Castilleja* in the field.

³ "A Revision of *Synthyris* and *Besseyia*" in Proc. Acad. Nat. Sci. Phila., 85: 77-106, 1933; with correction, "A Note on the Distribution of *Synthyris schizantha*", l.c., 86: 515-516, 1934. "Scrophulariaceae of the Northwestern United States—II. Pedicularis of the Group Bracteosae" in Bull. Torrey Bot. Club, 61: 441-448, 1934. (The first paper of this series was in 1928, before my visit to the Northwest.)

⁴ Observations made on this expedition contributed to the keys to species of *Penstemon*, *Mimulus*, and *Castilleja* presented by me in Morton E. Peck's "Manual of the Higher Plants of Oregon" in 1941, preparatory to which I published in Notulae Naturae of this Academy "New Scrophulariaceae from Oregon. I.—*Mimulus* and *Penstemon*" (as number 71, 16 pages, Feb. 13, 1941) and "II.—*Castilleja*" (as number 74, 11 pages, Feb. 25, 1941).

⁵ On these and on adjacent mountains of northwestern Wyoming were collected two undescribed species of *Pedicularis*, that with species of *Penstemon* gathered on earlier trips, were published in a paper entitled "Some new Scrophulariaceae from Montana and adjacent Idaho and Wyoming" in Notulae Naturae, number 95, 11 pages, March 27, 1942.

the American Philosophical Society, I spent most of the growing season in the marvellously diversified state of California, and was also in the Arizona mountains during the vegetative activity of September. Each of these journeys covered three or four summer months, except that the last, as befitted the longer season of California, was for full six months. In the contemplated monograph I shall tell in some detail of these expeditions. Now, I wish to give my sincere thanks to those who have shown such interest in my studies, and in fullest measure to the American Philosophical Society as the supporter of the work of three several seasons.

I should like to have withheld until the completion of my monograph the new entities that are coming to view during the progress of this study, so that each could then be presented in clearest comparison with its relatives. But the papers already cited show that it has been necessary to describe some of these already, most notably the new entities from Oregon, in anticipation of Dr. Peck's "Manual". Similarly, in preparation for T. H. Kearney and R. H. Peebles' "Flowering Plants and Ferns of Arizona" in 1942, I published as number 43 of *Notulae Naturae*, "New Species of Scrophulariaceae from Arizona", a brochure of 10 pages issued May 15, 1940. Now I am again confronted with the necessity of presenting the accounts of new entities in advance of my own revision, and this on a larger scale than those just mentioned.

This is because of the presumed prior appearance of the third volume of Dr. Le Roy Abrams' "Illustrated Flora of the Pacific States, Washington, Oregon, and California," a work now being issued by the Stanford University Press. When in California in 1940, I was invited by Dr. Abrams to prepare the text of the Scrophulariaceae for his "Flora", a request deeply appreciated by a visitor to a state so well supplied with enthusiastic botanists. Excepted were only *Penstemon* and *Orthocarpus*, genera that have both received especial study by Dr. David D. Keck, who is Dr. Abrams' associate at Stanford University. The preparation of keys, descriptions, synonymy, and statements of distribution has been completed for the remaining genera, and the text has been sent to California. But, in so doing, both Dr. Abrams and I think that it would be well to present in the Proceedings of our Academy the new entities, other than mere new combinations and names, that have to be proposed, since it is desirable that these be accompanied by ample discussion and by the required Latin diagnoses, details that do not fit into the text of a formal "Flora". Such matter is more appropriate to our publications.

One detail, always desirable for such new proposals, will, however, be carried in Abrams' "Illustrated Flora" rather than in our Proceedings. Each species there included is being shown by clear line-drawings, and the

consultant will find in Abrams' work each of the new ones proposed in the present paper. These drawings are being prepared by Mrs. Jeanne Janish, and I think will prove unusually satisfactory.

Until the appearance of my monograph the citation of specimens beside that selected for the type is being deferred. For the entities in this paper, usually several or many specimens have been seen, although some are as yet known only from a single collection. The supporting evidence of further cited collections, both in confirmation of the characters adduced and for indicating the exact distributions, will be fully given in my contemplated monograph. While such data are needed to show the degree of variation, and have been used in formulating my descriptions, taxonomically each entity stands as based upon the single type-collections now cited.

The entities herewith proposed are: in *Mimulus* 9 species, 3 subspecies, and 3 other names; in *Scrophularia* 1 species and 1 other name; in *Asarina* 15 transfers; in *Pedicularis* 2 subspecies; in *Castilleja* 10 species, 4 subspecies, and 1 other name; in *Dicranostegia* (new as a genus) 1 transfer; and in *Cordylanthus* 8 species and 1 subspecies.

MIMULUS Linnaeus

For over a century there have been two divergent views as to the limits of this genus. Thomas Nuttall in 1838 proposed beside it two Californian genera, *Diplacus* and *Eunanus*, which were adopted by George Bentham in his world monograph of this family in 1846. But in 1876 Asa Gray, in view of the many more species that had by then been discovered, relegated Nuttall's genera to sections of *Mimulus*, a treatment that was followed by Bentham and Hooker in their "Genera Plantarum" of the same year. Nine years later Edward L. Greene restored the several genera, and from 1885 to the present some works have taken the inclusive and some the exclusive course. The careful monograph of Dr. Adele L. Grant in 1925 made one genus of the whole, and that I am doing at least for the present.

This whole matter must receive more careful consideration in my proposed western monograph than I can give it now. In the field I have repeatedly noticed an interesting feature that has been hitherto overlooked, the fact that in true *Mimulus* (in the sense of those species with the septum of the capsule splitting only near apex or not at all, Grant's subgenus *Synplacus*) the corollas drop soon after anthesis, whereas in *Diplacus* and *Eunanus* et al. (the species with the septum of the capsule splitting to base, Grant's subgenus *Schizoplacus*) the corollas persist and shrivel upon the developing capsule. But there is difficulty in rigidly applying this distinction, since one species, *Mimulus breweri*, has the capsule of *Synplacus* with the persisting corolla of *Schizoplacus*. As shown on the key below, and recognized by Dr. Grant, there is a correlation of long pedicels with *Synplacus*

and short ones with *Schizoplacus*. So far, these features all suggest the propriety of recognizing at least two genera here. But on the other hand, there are such characters in common as the repeated tendency to elongation of the uppermost calyx-lobe and the remarkably smooth seeds, while both *Synplacus* and *Schizoplacus* develop minute species that would be hard to distinguish generically. So I am holding the two groups together for the present, but realize that generic delimitation here must await further comparison with related genera, and is a problem for future study.

For the present I am recognizing ten sections of *Mimulus* in its inclusive sense, as shown in the following key. It is necessary to present this now, since two of the sections are being proposed as new to science.

- A. Capsule symmetrical, soon dehiscent, its pedicel medianly attached.B
- AA. Capsule asymmetrical, more woody, tardily or not dehiscent; corolla yellow or purple, semi-persistent, shriveling on the developing capsule; pedicels shorter than calyces; annual or biennial herbs.X. *Oenoe*
- B. Septum of capsule not or only distally splitting; pedicel longer than the calyx (or merely equaling it in *Monimanthé*).C
- BB. Septum of capsule splitting to base, the capsule dehiscing mainly on the dorsal suture; corolla semi-persistent, shriveling on the developing capsule; pedicels shorter than calyces.H
- C. Corolla deciduous, dropping before shriveling, the styles evident on the young capsules.D
- CC. Corolla semi-persistent, purple, usually shriveling on the developing capsule; pedicels equaling or slightly longer than calyces; annual herb.VI. *Monimanthé*
- D. Seeds cuneate to base, longitudinally lined; capsule 13-18 mm. long; corolla 40-50 mm. long, purple or red; anthers ciliate; perennial herbs.I. *Erythranthe*
- DD. Seeds rounded to both ends, smooth or finely striate; capsule, and usually also the corolla, smaller.E
- E. Corolla yellow or purple, the upper lobes spreading or somewhat recurved laterally.F
- EE. Corolla violet, the upper lobes sagittally reflexed; septum of capsule slightly splitting at apex; calyx cylindric, slightly ridged; perennial or biennial herbs.V. *Eumimulus*
- F. Calyx cylindric, moderately or not inflated, the lobes permanently straight or nearly so, and the throat not or only slightly plicate; corolla-throat openG
- FF. Calyx sagittally compressed, strongly inflated, the uppermost lobe longest and projecting, and other pairs of lobes plicate, the lowest usually upcurving against the lateral pair; corolla yellow, its throat horizontally compressed and the orifice partially or wholly closed by the large hairy ventral ridges; septum of capsule not splitting; perennial or usually annual herbs.IV. *Simiolus*
- G. Capsule glabrous, wholly enclosed within calyx, the septum not or only slightly splitting distally; calyx-lobes shorter than tube, the uppermost less than twice length of others, the mid-rib of each sepal forming a ridge or low wing; perennial or annual herbs.II. *Paradanthus*
- GG. Capsule glandular-puberulent, loosely surrounded by calyx, the septum splitting $\frac{1}{2}$ to $\frac{1}{2}$ its length; sepals unequal in size and unequally joined, the uppermost longest and the lowest united about $\frac{1}{2}$ length, all with faint unraised midribs; annual herb.III. *Mimuloides*
- H. Calyx 20-40 mm. long, its tube proximally cylindric and distally more campanulate and ridge-angled; corolla 30-65 mm. long, yellow, orange, or red; stems woody, at least at base.VII. *Diplacus*

- HH. Calyx 2-20 mm. long, its tube uniform throughout; corolla 4-45 mm. long, yellow or purple; plants annual. I
- I. Anthers all developed; calyx-tube plicate, the lobes equal or unequal; stems over 1 cm. tall. VIII. *Eunanus*
- II. Anthers of one pair smaller or lacking; calyx-tube plane, the lobes very unequal; stems not over 1 cm. tall. IX. *Microphyton*

Mimulus, Sect. I, Erythranthe (Spach) Greene

Proposed as a genus by Spach in 1840 and adopted as a section of *Mimulus* by Greene in 1885, this is a natural group of the western United States and northern Mexico. It includes no new species from the Pacific States.

Mimulus, Sect. II, Paradanthus Grant

This evolutionarily basic section of *Mimulus* was first distinguished by Dr. Grant in 1925. It is the richest in number of species, including 39 in the Pacific States of which the following are now proposed as new to science.

1. *Mimulus macranthus* spec. nov.

Perennial glandular-villose herb, rhizomatose, the stems erect or ascending, 1-3 dm. tall, the leaf-blades oblong-ovate to oval, acute, saliently denticulate to dentate, pinnately veined (with several pairs of divergent veins), proximally rounded or somewhat narrowed to short petioles or the upper usually sessile, the largest blades 2-4 cm. long, 10-17 mm. wide. Flowers from distal axes, the pedicels becoming 15-35 mm. long. Calyx becoming 10-12 mm. long, ridge- to wing-angled, its lobes 2-3 mm. long, lanceolate, acute, often slightly unequal. Corolla 22-26 mm. long, yellow, externally sparsely pubescent to nearly glabrous, the throat tubular-cylindric, ventrally two-ridged and densely pubescent, the ridges with brown spots and the throat on all sides (especially ventrally) with fine blackish lines, the lobes all spreading and nearly alike. Anthers included, glabrous. Stigmas distinct, equal. Style glabrous. Capsule 7-8 mm. long, thin-walled, acute, symmetrical, not dehiscing through septum, and not filling the calyx. Seeds smooth, ovoid.

Herba perennis, glandulari-villosa, rhizomatosa, caulibus erectis vel adscendentibus, 1-3 dm. altis, foliis oblongo-ovatis ovalibusve acutis dentatis petiolatis vel superioribus sessilibus; pedicelli 15-35 mm. longi; calyx 10-12 mm. longus, valde angulatus, lobis 2-3 mm. longis lanceolatis; corolla 22-26 mm. longa, flava, fauce cylindricâ nigro-lineatâ et in latere ventrali dense pubescente brunneo-maculatâque; antherae glabrae; stigmata aequalia; capsula 7-8 mm. longa, symmetricalis, per septum non dehiscens.

Type, along stream in coniferous (*Pseudotsuga*) forest, 3900 feet altitude, Hatchet Mountain, 6 to 8 miles west of Burney, Shasta County, California, collected in flower June 7, 1940, by Francis W. Pennell, no. 25710; in herbarium of Academy of Natural Sciences of Philadelphia.

This comprises the major part of the material that has been called *Mimulus moschatus longiflorus* Gray (not *M. longiflorus* (Nutt.) Grant), the remainder being mostly *M. inodorus* Greene. These plants, especially de-

veloped in the Cascade Range, and including also *M. moniliformis* Greene, have been usually treated as forms of the Musk Flower, *M. moschatus* Dougl., but they seem better considered as distinct species, separable as follows:

- A. Leaf-blades rounded to narrowed at base; corolla about 25 mm. long.
 - B. Plant with foliage finely pubescent to glabrous, the stem sometimes villose-pubescent; leaf-blades denticulate, all petioled. *M. moniliformis*
 - BB. Plant more hairy; leaf-blades sharply toothed, at least the upper obscurely petioled or sessile.
 - C. Anthers glabrous; leaf-blades tending to ovate; plant erect or ascending. *M. macranthus*
 - CC. Anthers finely pubescent; leaf-blades tending to oblong; plant lax, diffuse. *M. inodorus*
- AA. Leaf-blades truncate to rounded at base, all petioled; corolla about 20 mm. long; plant glandular-pubescent. *M. moschatus*

2. *Mimulus multiflorus* spec. nov.

Annual glandular-pilose to -villose herb, the much-branched stems diffusely ascending, 2 dm. long, the leaf-blades lance-ovate, acute, entire to remotely denticulate, pinnately veined, cuneately rounded to petioles less than $\frac{1}{2}$ the length of the blades, the largest blades 1.4-1.6 cm. long or less, 5-9 mm. wide. All but the lowermost leaves subtending flowers, the pedicels becoming 9-14 mm. long, spreading and distally upcurved. Calyx 5-6 mm. long, glandular-pilose, ridge- to wing-angled, its lobes all equal, triangular, acute, finely ciliate. Corolla 10-13 mm. long, lemon-yellow, the throat cylindric-campanulate, ventrally with low short-pubescent ridges, paler and with fine brown spots, the orifice open and the spreading lobes rounded. Anthers yellow, glabrous. Stigmas equal, semicircularly rounded, fimbriolate. Style glabrous. Capsule 5 mm. long, ellipsoid-cylindric, thin-walled, symmetrical, not dehiscent through septum. Seeds semi-globose, smooth.

Herba annua, glandulari-pilosa vel -villosa, caulibus ramosissimis adscendentibus, 2 dm. longis, foliis lanceolato-ovatis acutis integris vel paucedenticulatis brevi-petiolatis; pedicelli 9-14 mm. longi; calyx 5-6 mm. longus, valde angulatus, lobis aequalibus triangularibus acutis; corolla 10-13 mm. longa, flava, fauce cylindricâ in latere ventrali brevi-pubescente; antherae glabrae; stigmata aequalia; capsula 5 mm. longa, symmetricalis, per septum non dehiscens.

Type, moist granitic gravelly sand, at 3700-3800 feet altitude, 4 miles east of Dunlap, Fresno County, California, collected in flower and fruit August 9, 1940, by Francis W. Pennell, no. 26451; in herbarium of Academy of Natural Sciences of Philadelphia.

3. *Mimulus trisulcatus* spec. nov.

Annual herb, pilose to villose with glandless and interspersed glandular hairs, the simple or loosely branched stems ascending, 0.5-2 dm. long, the leaf-blades ovate or lance-ovate, acute, entire to slightly dentate, pinnately veined, 1.3-1.8 cm. long or less, 8-11 mm. wide, rounded to petioles less than $\frac{1}{2}$ length of blades. All but the lowermost leaves subtending flowers, the

pedicels becoming 10-20 mm. long, ascending-spreading and distally slightly upcurved. Calyx 7-9 mm. long, rather finely glandular-pubescent or -pilose, ridge-angled, its lobes all equal, acuminate, finely ciliate. Corolla 15-17 mm. long, yellow, the throat narrowly campanulate, ventrally with two highly raised pinard-yellow ridges pubescent with clavate hairs, separating three deeper yellow channels which distally (and on sides of the ridges) bear orange to brown spots, the spreading lobes rounded. Anthers yellowish white, glabrous. Stigmas equal, semicircularly rounded, minutely fimbriolate. Style glabrous. Capsule 6 mm. long, ellipsoid-cylindric, thin-walled, symmetrical, not dehiscing through septum. Seeds ovoid, smooth.

Herba annua, pilosa vel villosa partim pilis glandiferis, caulibus adscendentibus 0.5-2 dm. longis, foliis ovatis vel lanceolato-ovatis acutis plerumque integris brevi-petiolatis; pedicelli 10-20 mm. longi; calyx 7-9 mm. longus, valde angulatus, lobis aequalibus acuminatis; corolla 15-17 mm. longa, flava, fauce cylindricā in latere ventrali trisulcatā pubescente; antherae glabrae; stigmata aequalia; capsula 6 mm. longa, symmetricalis, per septum non dehiscens.

Type, moist gravelly granitic soil, at 7000 to 7600 feet altitude, on western slope of Mineral King, Tulare County, California, collected in flower and early fruit August 6, 1940, by Francis W. Pennell and Arthur Cronquist, no. 26421; in herbarium of Academy of Natural Sciences of Philadelphia.

Mimulus multiflorus and *M. trisulcatus* are two of four local members of the group of *M. floribundus* Douglas in the southern Sierra Nevada of California, the others being *M. dudleyi* Grant and *M. subulatus* (*M. floribundus subulatus* Grant). While *M. floribundus* ranges widely over the western United States these others are all surprisingly restricted, but the portrayal of their actual distributions is left until my fuller treatment. They may be distinguished as follows:

- A. Throat of corolla cylindric, the ventral ridges narrow; pedicels not over $1\frac{1}{2}$ times the length of the bracts.
 - B. Lobes of calyx triangular-subulate, $\frac{1}{2}$ length of tube; corolla 10-18 mm. long; stem villose with glandless hairs. *M. subulatus*
 - BB. Lobes of calyx triangular-acute to -acuminate, less than $\frac{1}{2}$ length of tube.
 - C. Corolla 15-20 mm. long, its throat more than twice width of basal tube; pedicels 20-30 mm. long; stem villose with glandless hairs. *M. dudleyi*
 - CC. Corolla less than 15 mm. long, its throat little wider than the basal tube; pedicels 10-20 mm. long; stem villose with glandless or largely gland-tipped hairs.
 - D. Leaf-blades ovate, dentate or denticulate (except in dwarves); corolla 5-12 mm. long. *M. floribundus*
 - DD. Leaf-blades lance-ovate, entire to slightly denticulate; corolla 10-13 mm. long; racemes narrower and more elongated. *M. multiflorus*
 - AA. Throat of corolla somewhat flattened, the ventral ridges so wide and prominent as to separate three deep channels that are richer-yellow and coarsely spotted or blotched; pedicels $1\frac{1}{2}$ to 2 times the length of the bracts. *M. trisulcatus*

4. *Mimulus patulus* spec. nov.

Annual glandular-pilose herb, the stems ascending, 1-2 dm. tall, the leaf-blades ovate, obtuse or acutish, undulately dentate, palmately 3-veined,

0.5-1.2 cm. long, 4-9 mm. wide, rounded-truncate to petioles 1 to 2 times length of blades (the lowermost leaves small and mostly lost by anthesis, the mid-cauline on petioles 6-14 mm. long). All but the lowest leaves subtending flowers or else abbreviated floriferous branches, the ascending-spreading pedicels becoming 13-20 mm. long. Calyx 6-7 mm. long, glandular-puberulent, unspotted, ridge- to wing-angled, its lobes all equal, acutish to acute, finely ciliolate. Corolla 7-9 mm. long, yellow, the throat narrowly campanulate, ventrally with two low slightly pubescent ridges, the lobes rounded. Anthers yellow, glabrous. Stigmas equal or nearly so, rounded, entire. Style glabrous. Capsule not filling calyx, 5 mm. long, ellipsoid-ovoid, thin-walled, symmetrical, not dehiscing through septum. Seeds ellipsoid, smooth.

Herba annua glandulari-pilosa, caulibus adscendentibus 1-2 dm. altis, foliis ovatis undulato-dentatis longepetiolatis; pedicelli 13-20 mm. longi; calyx 6-7 mm. longus, valde angulatus, lobis aequalibus acutis; corolla 7-9 mm. longa, flava, fauce cylindricā in latere ventrali parum pubescente; antherae glabrae; stigmata aequalia vel subaequalia; capsula 5 mm. longa, symmetricalis, per septum non dehiscens.

Type, Wawawai, southeastern Washington, collected in flower and fruit May, 1897, by A. D. E. Elmer, no. 752; in herbarium of Academy of Natural Sciences of Philadelphia.

Closely akin to *Mimulus ampliatus* Grant and *M. washingtonensis* Gandoger, all of the interior Columbia River valley, the three distinguishable as follows:

A. Style glandular-pubescent; corolla 12-15 mm. long; calyx becoming 6-8 mm. long.
M. washingtonensis

AA. Style glabrous.

B. Corolla 14-18 mm. long. *M. ampliatus*

BB. Corolla 7-9 mm. long. *M. patulus*

Actual interrelationships are to be more fully investigated in my coming monograph.

Mimulus, Sect. III, *Mimuloides* (Bentham) Gray

This was first proposed as a section of *Herpestis* C. F. Gaertner, under which its single species was first described as *H. pilosa* Benth., the reason being the lack of strong angling, the irregularity, and the partial separation of the sepals forming the calyx. Greene in 1886 made it a distinct genus, *Mimetanthe*, as did Kuntze in 1903 as *Mimulodes*. While not a complete *Mimulus* in the calyx, I think however that its closest alliance is with this genus, and that it can not be held apart unless one raises to generic rank several other of the sections now placed in *Mimulus*. Accordingly, I call its single widespread western species, *Mimulus pilosus* (Benth.) S. Watson.

Mimulus, Sect. IV, *Simiolus* Greene

This was proposed as a section by Dr. E. L. Greene in 1885, though with the inclusion of sect. *Paradanthus* Grant as well. It is surprising that

Greene should have missed the excellent correlation of characters that sets *Simiolus* off as a natural group. In western North America it is a common and taxonomically baffling assemblage of plants, perhaps worthy of generic rank.

5. *Mimulus pardalis* spec. nov.

Annual herb, loosely glandular-pilose, the stems erect or decumbent, 0.5-2 dm. tall, the leaf-blades widely ovate, acute, dentate with 3 to 5 pairs of sharp teeth, palmately 3-veined, glabrescent, 1.5-3 cm. long, 12-25 mm. wide, truncately rounded to petioles rather shorter than blades, the uppermost narrowed to sessile bases. Flowers from nearly all leaf-axils, 4 to 5 pairs, the pedicels becoming 15-60 mm. long, finely glandular-pubescent. Calyx 7-10 mm. long, conspicuously purple-spotted and -mottled, strongly plicate-angled, sparsely minutely glandular-pubescent and villulose-ciliate with glandless hairs (especially in the sinuses), its lobes acute, the uppermost longest, 1.5 mm. long, the lowest pair upcurved even to 90° against the lateral pair and uppermost calyx-lobe. Corolla 8-15 mm. long, yellow, externally glabrous, the throat nearly cylindric and dorsally arched, ventrally with 2 finely pubescent ridges, the lower lip exceeding upper and with deflexed-spreading lobes, the mid-anterior lobe with maroon blotch. Anthers yellow, glabrous. Stigmas nearly equal, narrow and minutely fimbriolate. Style minutely pubescent. Capsule stipitate within the inflated calyx, 3.5 mm. long, thin-walled, symmetrical, not dehiscing through septum. Seeds smooth, little longer than wide.

Herba annua, glandulari-pilosa, caulibus erectis vel decumbentibus 0.5-2 dm. longis, foliis late ovatis acutis dentatis petiolatis; pedicelli 15-60 mm. longi, minute glandulari-pubescentes; calyx 6-7 mm. longus, valde plicato-angulatus, lobis acutis supremo 1.5 mm. longo; corolla 7-9 mm. longa, flava, fauce cylindricā in latere ventrali minute pubescente; antherae glabrae; stigmata subaequalia; capsula 3.5 mm. longa, symmetricalis, per septum non dehiscens, in calyce inflato stipitata; semina laevia.

Type, crevices of serpentine rock, at 1600 feet altitude, Red Hills above Peoria Flat, Tuolumne County, California, collected in flower April 11-16, 1919, by Roxana S. Ferris, no. 1602; type in Dudley Herbarium of Stanford University, isotype at Academy of Natural Sciences of Philadelphia.

Apparently distinct from all form of *Mimulus nasutus* Greene, the uppermost lobe of the calyx being less narrow and exserted, the pedicels glandular-pilose the entire length (instead of only near base on upper side), the leaf-blades less saliently toothed, and the stem more diffuse and geniculate. The calyx in form and marking, as well as the habit of the plant, is as described for *M. marmoratus* Greene, but the larger flowers of that plant (20-25 mm. long), the more slender and elongated uppermost calyx-lobe (as seen at anthesis), and the salient teeth of the leaf-blades show it to be a form of *M. nasutus*.

6. *Mimulus guttatus* Fischer

This dominant plant of western North America was evidently first described from plants grown from seeds obtained by Langsdorff in Alaska. This name, or *Mimulus langsdorffii* Donn, a name only validated in 1895 by Dr. E. L. Greene's adoption of it, has been used for a large portion of the section *Simiolus* as it occurs in western North America, while for some decades these plants were joined to *M. luteus* L. of Chile. The plants of southern South America are closely related but clearly different specifically from *M. guttatus*, and the same applies to many intimately allied species of the western United States. But even with many of these removed, *M. guttatus* remains the most widespread and dominant representative of *Simiolus* in North America. But it seems to fall into several geographic subspecies, as follows:

- A. Stem 3 dm. tall or more, erect or decumbent, simple or with ascending branches; inflorescence finely glandular-pubescent; style pubescent.
- B. Corolla 30-45 mm. long, its throat campanulately expanding; fruiting calyx 18-23 mm. long; leaf-blades usually ovate or wider.
 - C. Leaf-blades as wide as long or wider, mostly cordate; calyces softly pubescent, the lobes usually relatively blunt; pedicels relatively densely pubescent. *M. g. litoralis*
 - CC. Leaf-blades not wider than long, only the lowest, if any, cordate; calyces loosely pubescent or glabrescent, the lobes usually relatively sharp; pedicels relatively less pubescent. *M. g. typicus*
 - BB. Corolla 20-30 mm. long, its throat usually more gradually expanding; fruiting calyx 12-17 (-20) mm. long; leaf-blades ovate to oblong-ovate, usually merely denticulate.
 - C. Leaf-blades 1 to 2 times as long as wide. *M. g. puberulus*
 - CC. Leaf-blades usually 3 to 4 times as long as wide; plant more freely stoloniferous. *M. g. scouleri*
- AA. Stem 1-2 dm. tall, simple to usually diffusely much branched, the inflorescence sparsely glandular-pubescent to glabrescent; corolla 25-35 mm. long; style glabrescent or glabrous. *M. g. arenicola*

Mimulus guttatus typicus

This large-flowered representative of the species occurs from Alaska (where it is the only form) to southern California, in the western United States west of the Cascade Range and the Sierra Nevada.

Mimulus guttatus litoralis subsp. nov.

Plants usually stouter, often more repent, distally softly and velutinously pubescent, especially on the calyces. Leaf-blades mostly as wide as, or wider than long, and also cordate. Calyx-lobes usually blunter than in *typicus*, the uppermost lobe at times even rounded. Corolla 30-45 mm. long, relatively wide, the prominent palate extending much beyond the upper lip, its uparching ridges closing the orifice to the throat.

Robustior, velutinus, foliis latioribus cordatis; calyx mollis, lobis minus acutis; corolla 30-45 mm. longa, ampla.

Type, wet place, bluffs on sea-beach near Otter Rock, Lincoln County, Oregon, collected in flower and fruit July 19, 1939 by Bassett Maguire, no. 17304; in herbarium of Academy of Natural Sciences of Philadelphia.

A characteristic and magnificent plant that grows in masses along the rocky coast of Oregon and northern California, where it replaces subspecies *typicus*.

***Mimulus guttatus puberulus* (Greene) Grant**

This name first appeared as taken up by Rydberg in his "Flora of Colorado", page 311, in 1906, as *Mimulus puberulus* Greene, where it was distinguished from what was assumed to be *M. langsдорffii* by having its "leaves and stem pubescent throughout"; in 1909 Greene gave the first actual description (Leaf. Bot. Observ., 2: 4), and similarly applied it to the pubescent plant of Colorado. But this does not seem to me actually distinguishable from the common plant so widespread through the Rocky Mountain and Intermontane states, a plant distinguishable from true *M. guttatus* by its habitually smaller flowers. Were one to consider the two as separate species there are a number of names available for the common plant of the western United States, but as a subspecies the earliest trinomial is *puberulus*, which Dr. Grant intended to apply only to its pubescent extreme. Accordingly, I adopt it now.

***Mimulus guttatus scouleri* (Hooker) comb. nov.**

We need to know whether the narrow-leaved *Mimulus scouleri* Hook., from along the Columbia River, be actually a local subspecies of *M. guttatus*, or if it pertain to abnormally narrow-leaved individual plants. The Academy's herbarium shows specimens resembling Scouler's type from near Astoria in Clatsop County, Oregon, where they were gathered by Thomas Meehan in 1883, not far from Scouler's locality of a half century earlier; and from the John Day valley farther east in Oregon, gathered by E. P. Sheldon in 1902 (his number 10181).

***Mimulus guttatus arenicola* subsp. nov.**

Plants low, 0.5-2 dm. tall, simple to usually diffusely much branched, the inflorescence less pubescent (sparsely glandular-pubescent to glabrous), the corollas 25-30 mm. long, and the style minutely pubescent to glabrous.

Humilis, 0.5-2 dm. altus, saepissime diffusus ramosissimusque, inflorescentiā sparse glandulari-pubescente glabrata; corolla 25-30 mm. longa; stylus minute pubescens glabrata.

Type, sandy flat above beach, Pacific Grove, Monterey County, California, collected in flower June 28, 1940 by Francis W. Pennell, no. 26020; in herbarium of Academy of Natural Sciences of Philadelphia.

Sandy beaches of Monterey County, California, especially in moist hollows among dunes.

7. *Mimulus platycalyx* spec. nov.

Annual herb, glabrous below the finely pubescent inflorescence, the stems simple, erect, 0.3-1.3 dm. tall, the leaves much shorter than internodes, their blades orbicular-ovate, acute or acutish, sinuately dentate, palmately 5-veined, 0.8-1.2 cm. long and wide, slightly cordate to petioles shorter than blades, the upper leaf-blades smaller, entire, and rounded to sessile bases. Flowers from upper axils, 1 to 3 pairs, the pedicels becoming 10-15 mm. long (or very short in dwarves), finely glandular-pilose. Calyx becoming 9-14 mm. long, glabrescent, strongly plicate and sharply angled, much distended about fruit, the lobes acute with callose tips, the uppermost longest and projecting, the others 2 mm. shorter and even, the lowest pair upcurving, all with distal margins sparsely ciliolate with glandless hairs and becoming villously so in the sinuses. Corolla 20 mm. long (smaller in dwarves), yellow, externally glabrous, its throat horizontally widened, or dorsally arched, ventrally deeper yellow and brown-spotted, with 2 large densely pubescent ridges that join distally into a palate nearly closing orifice, the lower lip longer and with deflexed-spreading lobes. Anthers pale yellow, glabrous. Stigmas equal, ovate-rounded, densely and finely fimbriate. Style sparsely pilose with minute glandless hairs. Capsules stipitate (stipe $\frac{1}{3}$ length of body) within the inflated calyx, flattened-ovoid, thin-walled, symmetrical, not seen fully mature.

Herba annua, sub inflorescentia glabra, caulibus erectis 0.3-1.3 dm. altis, foliis orbiculari-ovatis acutiusculis sinuate dentatis petiolatis; pedicelli 10-15 mm. longi, minute glandulari-pilosi; calyx 9-14 mm. longus et latus, valde plicato-angulatus, lobis acutis callosis supremo 2 mm. longiore; corolla 20 mm. longa, flava, fauce compressâ in latere ventrali dense pubescente; antherae glabrae; stigmata subaequalia; capsula symmetricalis, per septum non dehiscens, in calyce inflato stipitata, non visa matura.

Type, moist soil over granitic rock, at 4500 feet altitude, 1 mile south of Wawona, Yosemite National Park, Mariposa County, California, collected in flower May 28, 1940 by Francis W. Pennell, no. 25580; in herbarium of Academy of Natural Sciences of Philadelphia.

An ally of *Mimulus guttatus* Fisch., but differing essentially in its fruiting calyces being fully as wide as long. The calyces are characteristically rounded.

Mimulus, Sect. V, Eumimulus

This typical section of *Mimulus* comprises in North America only the two species, *M. ringens* L. and *M. alatus* Ait., widespread over the eastern part of the continent. Dr. Grant places with them three species of the Old World tropics, but I suspect that characters may be found indicating that the latter should form a separate section.

Mimulus, Sect. VI, Monimanche sect. nov.

This section, comprising only the single species, *Mimulus breweri* (Greene) Coville, widespread over the western United States, is midway

between the subgenera *Synplacus* and *Schizoplacus* of Grant; as already explained, it has the unsplit septum of the capsule of the former, but the corollas are only tardily deciduous as in the latter. The length of the pedicels is intermediate between the two groups.

Mimulus, Sect. VII, *Diplacus* (Nutt.) Gray

This section, comprising suffrutescent or usually woody species that occur from northern Baja California to southern Oregon, is so peculiar in aspect as to be usually considered as a distinct genus.

8. *Mimulus bifidus* nom. nov.

This is proposed as a new name for *Diplacus grandiflorus* Groenl., described in 1857 but preoccupied in *Mimulus* by *M. grandiflorus* Howell, 1901. Since the species is not only very large-flowered (corolla 50-65 mm. long) but is even better characterized by its deeply notched corolla-lobes (notches $\frac{1}{4}$ to $\frac{1}{2}$ their depth), this new name is equally appropriate. The species grows in great beauty in the canyons of the northern Sierra Nevada, where I recall it in profusion along the Feather River, but is represented by a narrower-leaved and smaller-flowered subspecies in the Santa Lucia Mountains of Monterey County, California.

***Mimulus bifidus fasciculatus* subsp. nov.**

Woody stems depressed, widely spreading, the herbaceous shoots ascending, brownish. Leaf-blades linear-oblong, 2-3 cm. long, 3-5 mm. wide, the main cauline ones subtending rather prominent leafy fascicles formed by abbreviated shoots. Pedicels 8-20 mm. long. Calyx 25-28 mm. long. Corolla 50 mm. long.

Depressus, foliis angustioribus lineari-oblongis 2-3 cm. longis, corollis 50 mm. longis.

Type, rocky hills, Santa Lucia Park, Arroyo Seco, at 2500 feet altitude, Monterey County, California, collected in flower May 10, 1936, by Lewis S. Rose, no. 36278; in herbarium of Academy of Natural Sciences of Philadelphia.

Distinguishable from subspecies *typicus* as follows:

- A. Leaves and bracts elliptic-oblong, 8-15 mm. wide; corolla 55-65 mm. long; stems erect or ascending. *M. b. typicus*
- AA. Leaves and bracts linear-oblong, 3-5 mm. wide; corolla 50 mm. long; plant lower and more spreading. *M. b. fasciculatus*

Mimulus, Sect. VIII, *Eunanus* (Benth.) Gray

The second largest section of *Mimulus*, comprising 24 species in the Pacific states. The formulation of a satisfactory key to the species has been difficult, although the species are better defined than in *Simiolus*.

9. *Mimulus microphyton* spec. nov.

Annual minutely pubescent herb, the glandular-pubescent stems erect, 1-2 cm. tall, simple, the leaf-blades elliptic, obtuse to rounded, entire, longitudinally veined, narrowed to sessile bases. Flowers several, from nearly all axils, the pedicels 1-2 mm. long, much shorter than the subtending leaves. Calyx in anthesis 5-6 mm. long, plicately angled. Corolla 10-13 mm. long, purple, externally nearly glabrous, internally ventrally with 2 yellow ridges on and between which somewhat pubescent, the lobes rounded and somewhat spreading. Anthers yellow, ciliate on lower side. Stigmas purple, equal, rounded, ciliolate. Style glandular-pubescent. Capsule not seen.

Herba annua, caule glandulari-pubescente 1-2 cm. alto, foliis ellipticis obtusis rotundatisve integris sessilibus; pedicelli 1-2 mm. longi; calyx ad anthesem 5-6 mm. longus, plicatus, lobo supremo longissimo; corolla 10-13 mm. longa, purpurea, fauce in latere ventrali pubescente; antherae ciliatae; stigmata aequalia; capsula non visa.

Type, wet slopes of Tumwater Canyon, at 1000 feet altitude, near Leavenworth, Chelan County, Washington, collected in flower May 21, 1937 by J. William Thompson, no. 8280; in Dudley Herbarium of Stanford University.

Distinguishable from *Mimulus cusickii* (Greene) Piper, the other north-western species with similarly wide leaves, by the following contrast:

- A. Corolla 20-25 mm. long; calyx-lobes ovate-acuminate or -cuspidate; bracts acute to acuminate; stem 0.5-3 dm. tall, leafy. *M. cusickii*
 AA. Corolla 10-13 mm. long; calyx-lobes uniformly tapering; bracts obtuse to broadly rounded; stem less than 0.3 dm. tall, bare below the single leaf-cluster.

M. microphyton

10. *Mimulus platylaemus* spec. nov.

Annual herb, pubescent with recurved fine glandless hairs beyond which project gland-tipped ones, the stem erect, 6-12 dm. tall, simple or with ascending branches, the leaf-blades narrowly elliptic or lance-elliptic, acute, denticulate-serrate to nearly entire, longitudinally and pinnately veined, cuneate to sessile bases. Flowers from all but lowest axes, the pedicels 2-3 mm. long, much shorter than their subtending leaves. Calyx becoming 20-25 mm. long, plicate-ridged, narrow intervening surface white and glabrescent in contrast to the green and glandular-hirsute ridge-folds, its lobes ovate-acuminate to -attenuate, the uppermost much the longest, lance-attenuate and upcurving, projecting 5 mm. beyond the lowest pair (sinus deepest between the latter, which are 3-4 mm. long, the postero-lateral pair united to the uppermost lobe which is free only 6-7 mm.). Corolla 25-30 mm. long, purple, externally pubescent proximally with glandless hairs, internally glandular-puberulent on all sides, the throat nearly campanulate, ventrally white and with two low ridges, the slightly spreading lobes rounded. Anthers pale yellow, glabrous. Stigmas white, ciliolate, the lower twice to thrice size of upper and pendent into orifice of corolla. Style distally glandular-puberulent. Capsule 18 mm. long, straight, acute, firm-walled, symmetrical, dehiscing distally both ventrally and dorsally, even through the septum. Seeds oblong-cylindric, smooth.

Herba annua glandulari-pubescent, caule erecto 6-12 dm. alto, foliis lanceolato-ellipticis acutis denticulato-serratis integrisve sessilibus; pedicelli 2-3 mm. longi; calyx 20-25 mm. longus plicatus, lobis acuminatis attenuatisve supremo longissimo 6-7 mm. longo; corolla 25-30 mm. longa, purpurea, intus glandulari-puberula, fauce fere campanulatâ in latere ventrali albâ; antherae glabrae; stigmata inaequalia; capsula 18 mm. longa, symmetricalis, per septum dehiscens.

Type, moist gravelly granitic sand, at 3700 to 3800 feet altitude, 4 miles east of Dunlap, Fresno County, California, collected in flower and fruit August 9, 1940 by Francis W. Pennell, no. 26453; in herbarium of Academy of Natural Sciences of Philadelphia.

Most closely related to the Sierran *Mimulus bolanderi* Gray, but distinguishable by the following contrast:

- A. Corolla 16-22 mm. long, its throat nearly cylindric; fruiting calyx 12-17 mm. long, its uppermost lobe usually 3-5 mm. long. *M. bolanderi*
 AA. Corolla 25-30 mm. long, its throat nearly campanulate; fruiting calyx 20-25 mm. long, its uppermost lobe 6-7 mm. long. *M. platylaemus*

Mimulus, Sect. IX, Microphyton sect. nov.

This section is now proposed for a reduced, evidently self-pollinating plant, presumably derived from *Eunanus* ancestry. The appropriateness of the name suggested is attested by that of the single species, the Californian *Mimulus pygmaeus* Grant, with its synonym, *M. minutissimus* Eastw.

Mimulus, Sect. X, Oenoe Gray

The most remarkable section of *Mimulus*, evidently akin to *Eunanus* but with asymmetrical capsule that is laterally attached at base and usually with long-tubed corollas that are adapted for butterfly-pollination. About a dozen species of the western United States.

11. *Mimulus brandegei* spec. nov.

Annual herb, pubescent with spreading gland-tipped hairs, the stem simple, erect, 2-3 cm. tall, the leaf-blades narrowly elliptic to spatulate-oval, obtuse, entire or nearly so, 1-1.2 cm. long, 6-7 mm. wide, cuneately narrowed to shortly petioled bases. Flowers from upper axils, the pedicels 1-2 mm. long, strongly ridged at base of calyx. Calyx becoming 10-12 mm. long, straight or nearly so, the tube scarcely ridged (not plicate), finely glandular-pubescent, the obtuse lobes more so, the uppermost oblong and about $1\frac{1}{2}$ times the length of the others which are ovate with the mid-ventral sinus deepest. Corolla 13-15 mm. long, purple: its narrow tube equaling the calyx; its throat funnelform or more abruptly widened, less than $\frac{1}{3}$ length of tube; its lobes rounded, the upper two 3-4 mm. long, and the deflexed lower lobes about 1 mm. long. Anthers glabrous. Capsule 7 mm. long, slightly decurved, sagittally compressed, 2.5-4 mm. wide proximally, asymmetrical, tapering to acute tip ventrally and at base attached obliquely on ventral side to pedicel, the cells hard-walled, unequal, tardily or not dehiscent.

Herba annua glandulari-pubescent, caule erecto 2-3 cm. alto, foliis anguste ellipticis vel spathulato-ovalibus obtusis integris subintegrisque basi cuneatis et brevipetiolatis; pedicelli 1-2 mm. longi; calyx 10-12 mm. longus costatus, lobis inaequalibus supremo oblongo longissimo; corolla 13-15 mm. longa, purpurea, tubā quam calycem longā, fauce fere campanulatā et brevi; antherae glabrae; capsula 7 mm. longa, compressa, obliqua, tarde vel non dehiscens, ad pedicellum ventrale insidens.

Type, Santa Cruz Island, southern California, collected in flower and fruit in 1888 by T. S. Brandegee; in herbarium of Academy of Natural Sciences of Philadelphia.

Closely related to *Mimulus latifolius* Gray of Guadalupe Island, off the coast of Lower California, but distinguishable by the following contrast:

- A. Leaf-blades widely ovate or oval, bluntly denticulate, glaucescent, the larger rounded to the short petioles; stem hirsute-pubescent, some of the hairs gland-tipped; calyx plicate-ridged, loosely investing the capsule which protrudes from its deep ventral sinus, the calyx-lobes acute; lower lobes of corolla somewhat spreading, about $\frac{1}{2}$ length of the upper ones. *M. latifolius*
- AA. Leaf-blades narrowly elliptic to spatulate-oval, entire or nearly so, all cuneately narrowed at base; stem glandular-pubescent; calyx nearly plane, closely and permanently investing the capsule, the calyx-lobes obtuse; lower lobes of corolla apparently deflexed-spreading, about $\frac{1}{2}$ length of the upper ones. *M. brandegei*

It is scientifically tragic that the islands off the coast of southern California, with their peculiar endemic floras, should have been long devoted to sheep grazing. I have seen no recent collection of *Mimulus brandegei*, and the question arises, as to whether such will appear in the herbaria whose collections I plan to examine, or whether the little plant collected so long ago by T. S. Brandegee may have since become extinct.

SCROPHULARIA [Bauhin] Linnaeus

To clarify our knowledge of this somewhat confused group I present a key to the far western species. Specific limits have not been hitherto understood, nor has the identity of the old name *Scrophularia californica*.

- A. Inflorescence villose, the hairs tipped with small glands; sepals acute to acuminate; corolla 8-10 mm. long; sterile filament lacking or a minute rudiment; capsule very acute. 1. *S. villosa*
- AA. Inflorescence puberulent or short-pubescent, the hairs tipped with relatively large glands; sepals usually rounded (varying to acuminate in *S. californica*); sterile filament developed. B
- B. Corolla dark maroon, 9-11 mm. long, its upper half blackish, the tube globular-urceolate with constricted orifice, the lowermost lobe deflexed-spreading; sterile filament lance-oblong, blackish maroon; capsule obtuse or merely acute. 2. *S. atrata*
- BB. Corolla paler, the tube globular-cylindric to cylindric, with less constricted orifice, the lowermost lobe recurved; sterile filament paler; capsule acute to acuminate. C
- C. Sterile filament clavate to obovate, longer than wide, usually brown (but sometimes green in *S. multiflora*); capsule acute or shortly acuminate; inflorescence relatively lax. D

- CC. Sterile filament flabellate, wider than long, yellowish green; corolla 9-14 mm. long; capsule sharply acuminate; inflorescence elongated, stricter, the branches ascending-spreading; leaf-blades simply to doubly dentate, often incisely so near base, truncate or the lower slightly cordate at base.5. *S. lanceolata*
- D. Sepals oblong to ovate, acuminate to obtuse or (usually erosely) rounded; corolla 8-15 mm. long, the upper lobes nearly the length of the tube; capsule 6-8 mm. long, ovoid-conic; leaf-blades simply to doubly dentate with acute or blunted teeth, the larger blades cordate at base.3. *S. californica*
- DD. Sepals circular (or nearly so), broadly rounded; corolla 5-8 mm. long, the upper lobes shorter than the tube; capsule 4-6 mm. long, globose-conic; leaf-blades sharply toothed or incised, truncate to slightly cordate at base. ...4. *S. multiflora*

1. *Scrophularia villosa* Pennell

This entity, proposed by me as a species in 1923, was described independently by Dr. W. L. Jepson in his "Manual of the Flowering Plants of California" (p. 906) in 1925 as variety *catalina* of *Scrophularia californica*. It is confined to Santa Catalina Island, and seems to me the most distinct American species of the genus.

2. *Scrophularia atrata* spec. nov.

Stem 10-20 dm. tall, glandular-puberulent in inflorescence, glabrescent below. Leaf-blades ovate, acute, proximally doubly and distally simply dentate with rounded or broadly acute teeth, glabrous (except for somewhat puberulent main ribs), cordate to slender petioles, the larger leaves with blades 6-10 cm. long and 5-8 cm. wide, on petioles 2-7 cm. long. Panicle elongated, extending over $\frac{1}{2}$ length of plant, of 10 to 15 fascicles or more: primary peduncles divaricately spreading, the lower 3-4 cm. long; primary bracteoles lanceolate, attenuate, the secondary and tertiary ones smaller, the bracteoles equaling or shorter than their subtended peduncles or pedicels. Sepals 3 mm. long, ovate or lance-ovate, rounded, green, narrowly margined or slightly erose with thin pale or purplish tissue. Corolla 9-11 mm. long, dark maroon, the upper (dorsal) half blackish, its tube globular-urceolate with constricted orifice; its upper lobes from a narrow common base widening distally and projecting, the antero-lateral lobes obliquely truncate, and the mid-anterior lobe rounded and deflexed-spreading. Uppermost (sterile) filament lance-oblong, blackish maroon, much narrower than the neck of the upper lip of the corolla. Fertile filaments white, glandular-puberulent, the yellow anthers becoming slightly exerted by the deflexing of the lower corolla-lip. Stigma similarly slightly exerted. Capsule 6-8 mm. long, ovoid, obtuse or acute. Seeds 0.6-0.7 mm. long, ellipsoid, ridged and transversely sulcate.

Caulis 10-20 dm. altus, in inflorescentia glandulari-pubescent; foliorum laminae ovatae acutae dentatae basi cordatae, 6-10 cm. longae, petiolis 2-7 cm. longis; panicula ampla; sepala 3 mm. longa, ovata vel lanceolato-ovata, marginibus erosis; corolla 9-11 mm. longa atrorubra, dimidio superiore fere nigro, tubo globulari-urceolato ad orem constricto, lobo infimo deflexo-patente; filamentum sterile lanceolato-oblongum angustum fere nigrum; capsula 6-8 mm. longa, ovoidea, obtusa acutave.

Type, rocky limestone bank, behind beach at Surf, Santa Barbara County, California, collected in flower and fruit May 8, 1940, by Francis W.

Pennell, no. 25334; in herbarium of Academy of Natural Sciences of Philadelphia.

A very local and peculiar species.

3. *Scrophularia californica* Cham. & Schl.

This plant, originally collected by Chamisso and Eschscholtz at San Francisco in 1816 and described in 1827, proves to be the coastal species that I redescribed in 1928 (in Bull. Torrey Bot. Club, 55: 316) as *S. oregana*. It grows near the Pacific coast from Vancouver Island to southern California. It is less uniform southward, showing a variability that must receive further consideration in my coming monograph.

4. *Scrophularia multiflora* nom. nov.

Scrophularia californica floribunda Greene, Man. Bay-Reg. Bot. 273, 1894; not *S. floribunda* Boiss. & Bal., 1856. *S. californica laciniata* Jeps., Man. Fl. Pl. Calif., 906, 1925; not *S. laciniata* Waldst. & Kit., 1805.

Although no type seems to have survived for *Scrophularia californica floribunda*, Greene's characterization is clear and his statement, "the variety belonging to hills of the interior", well contrasts the range of *S. multiflora* with that of *S. californica*. *S. c. laciniata* is a cut-leaved extreme often encountered. This is the plant usually called *S. californica*.

5. *Scrophularia lanceolata* Pursh

In the Pacific states this transcontinental species occurs from British Columbia to northern California.

ASARINA [Lobel] Miller

As stated in my monograph of the "Scrophulariaceae of Eastern Temperate North America", the tribe Antirrhineae was held as a single genus *Antirrhinum* by Linnaeus but seems divisible into a group of coherent genera, as was recognized by Wettstein and adopted in my study. Several of these entities had been long distinguished, and I remarked upon Linnaeus having deliberately merged *Antirrhinum* Tourn., *Linaria* Tourn., and *Elatine* Dillenius. To these may be added *Asarina* Lobel.

Among his 28 species of *Antirrhinum*, Linnaeus in the first edition of the "Species Plantarum" (page 612, 1753), following his frequent habit of first disposing of aberrant species, listed as number 1, *A. asarina*. As I have explained in my paper on the generitypes ("genotypes") of the genera therein published,⁶ *A. asarina* differs from Linnaeus' characterization of his genus by having symmetrical capsules that are uniformly dehiscent. This species of the mountains of southwestern Europe would in the key given on page 298 of my monograph trace directly to *Maurandya*, except that the long-petioled

⁶ Proc. Acad. Nat. Sci. Phila., 82: 20, 1930.

and cordate leaf-blades have 5 to 7 pairs of angulate- to rounded-toothed shallow lobes. The form of the foliage and also the large flaring corollas, so at variance with those of *Antirrhinum* in its restricted sense, can be readily matched in such species as *Maurandya erecta* and *M. erubescens*. I have no hesitation in pronouncing *Asarina* and *Maurandya* congeneric, and, since the former has nearly forty years' post-Linnaean priority, it is the name to be adopted.

The name *Asarina* was presumably suggested by the leaf-form resembling somewhat *Asarum*, although, in contrast to that genus, the stems of the original species are usually considerably developed. A few of the American species are abbreviated in growth and more erect, but others are much elongated and twine extensively. The genus is mainly developed on and near the Mexican plateau, with some species in the contiguous states of our own Southwest. To these must now be added a representative in southwestern Europe. It is significant that both *Antirrhinum* and *Asarina* have species in these remote areas.

As remarked on page 314 of my monograph, the American species of *Maurandya* (*Asarina*) show remarkable floral diversity. They have evidently developed from ancestry highly adapted to pollination by bees. *Asarina antirrhiniflora* has wholly snapdragon-like flowers, a conspicuous yellow palate closing the orifice of the violet-blue corolla until depressed by a bee of suitable size and weight. Similar, but slightly larger, are the flowers of *A. barclaiana* and *A. wislizeni*. Similar also are the flowers of *A. stricta* (violet-blue) and *A. filipes* (yellow), that I am now transferring from *Antirrhinum*, thus removing from that genus species that in symmetrical capsule-dehiscence and in twining habit were aberrant here. *Asarina flaviflora*, *A. petrophila*, and *A. acerifolia* are peculiar in producing rather small yellowish corollas. The remaining American species show a trend that occurs also in *Penstemon* and other genera, leading from bee-pollinated ancestry into enlarged and reddened corollas fitted to the visits of humming-birds. *A. hirsuta* and *A. scandens* have corollas somewhat larger than *A. antirrhiniflora* and apparently somewhat purplish, while *A. erubescens*, *A. lophospermum*, *A. purpusi*, and *A. rosei* have them much enlarged, funnel-form-campanulate, and purple-red. The European *A. procumbens* shows corollas moderately enlarged and funnel-form-bilabiate, and is evidently responding to some homologous incentive to floral change; its pollination should be observed and reported.

The species of *Asarina*, as now recognized, are the following: *A. acerifolia* (*Maurandya acerifolia* Pennell); *A. antirrhiniflora* (*M. antirrhiniflora* Humb. & Bonpl.); *A. barclaiana* (*M. barclaiana* Lindl.); *A. erubescens* (*Lophospermum erubescens* Don); *A. filipes* (*Antirrhinum filipes* Gray); *A.*

flaviflora (*M. flaviflora* Johnston); *A. geniculata* (*M. geniculata* Rob. & Fern.); *A. hirsuta* (*M. erecta* Hemsl., 1882, not *Asarina erecta* Mill., 1768); *A. lophospermum* (*M. lophospermum* Bailey); *A. petrophila* (*M. petrophila* Cov. & Mort.); *A. procumbens* Mill. (*Antirrhinum asarina* L.); *A. purpusii* (*M. purpusii* Brandegee); *A. rosei* (*M. rosei* Munz); *A. scandens* (*Usteria scandens* Cav.); *A. stricta* (*M. stricta* Hook. & Arn.); and *A. wislizeni* (*M. wislizeni* Engelm.).

PEDICULARIS [Bauhin] Linnaeus

To this large genus, in which I have previously published a number of new far western species,⁷ I wish to add now two new subspecies.

1. *Pedicularis attollens* *protogyna* subsp. nov.

Stouter and larger-flowered than *P. attollens typica*, the stems 4-5 dm. tall, the inflorescence 1-2 dm. long, the beak of the galea 5-6 mm. long, and the lower corolla-lip 7-8 mm. long, concave, and over the pale proximal area showing three narrow purple lines median to each petal; flowers so strongly protogynous that the stigmas are only exposed previous to anthesis.

Corolla major, galeae rostro 5-6 mm. longo, labio inferiore 7-8 mm. longo concavo angusto-lineato; flos valde protogynus, stigmatum ante anthesin expositum.

Type, moist grassy meadow, at 4900 feet altitude, on road to Coppervale Ranger Station, east of Westwood, Lassen County, California, collected in flower June 10, 1940, by Francis W. Pennell, no. 25771; in herbarium of Academy of Natural Sciences of Philadelphia.

Occurs in the mountains of southern Oregon and northern California, there replacing subsp. *typica* which extends far through the Cascades and Sierra Nevada.

In contrast to the above characterization of *protogyna*, *Pedicularis attollens typica* has stems 3-4 dm. tall, the inflorescence 0.5-1.5 dm. long, the beak of the galea 3-4 mm. long, and the lower corolla-lip 5-6 mm. long, flattened, and over the whitish proximal area showing three wider and more conspicuous dark purple lines median to each petal, while its flowers are less strongly protogynous, the stigmas being exposed in early anthesis.

The protogyny of the flowers of *Pedicularis attollens* is of particular interest. Before seeing the plant in the field I had suspected self-pollination, this being a smaller-flowered relative of *P. groenlandica surrecta*, so conspicuous in bogs of our western mountains. In vain did I search herbarium material for receptive stigmas protruding from the apices of the galea-beaks. It seemed a natural inference that they never became exposed, but instead received the pollen from the flower's own anthers. But such an

⁷ Bull. Torrey Bot. Club, 55: 317-318. 1928; 61: 441-448, 1934.

inference was structurally unwarranted, since the stigma, unless greatly aborted, would be far above the anthers in the hood or expanded portion of the galea. In the field the situation became clear enough. The stigmas mature and are exposed long before the anthers, in *typica* being exposed and receptive in early anthesis, just as the flowers are opening, but in *protogyna* even earlier, before the flowers have otherwise opened at all. The spike blossoms indefinitely upward, and the bees must have the habit of alighting near its summit, and then walking down over the buds (with their exposed stigmas) to the actual opened flowers where they can obtain both nectar and pollen. This is the most extreme case of protogyny with which I am acquainted.

2. *Pedicularis racemosa alba* subsp. nov.

Corolla white or slightly purplish; leaf-blades linear-lanceolate to lanceolate, rarely wider, widest near the base and thence tapering to the apex.

Corolla alba vel albida; foliorum laminae lineari-lanceolatae vel lanceolatae, ex basi attenuatae.

Type, coniferous forest, at 3300 to 3400 feet altitude, near Musselshell Creek, near Lolo Creek, Clearwater County, Idaho, collected in flower July 16, 1937 by Francis W. Pennell, no. 20922; in herbarium of Academy of Natural Sciences of Philadelphia.

Pedicularis racemosa is the most widespread species of its genus over western North America. Throughout the Rocky Mountains and west to the Wallowa Mountains of northeastern Oregon and the mountain systems of Utah it is a white- or very pale-flowered plant with relatively narrow and long-tapering leaf-blades. But on the Cascade, Klamath, and more coastward mountains from southern British Columbia to northern California it is a plant with corolla from pale violet-purple to rose-purple and with leaf-blades lanceolate or widely so and which are usually widest about or slightly below the middle. This more colorful and conspicuously leafy plant is *P. racemosa typica*, the original collection of which came from "high mountains of the Grand Rapids of the Columbia", which would be the Cascade Range near that river in either Oregon or Washington.

CASTILLEJA [Mutis] Linnaeus filius

This genus, so abundant in western North America and so puzzling taxonomically, is still imperfectly understood. In revising its far western representation, a considerable number of new species and new combinations must be proposed. The latter are mostly deferred until the appearance of the appropriate part of Abrams' "Illustrated Flora", but the former are presented now.

1. *Castilleja arachnoidea* Greenman

This species, easily recognized by the arachnoid pubescence of the herbage that is associated with lanose pubescence on the galea which is nearly equaled by the lower corolla-lip, occurs at high altitudes on the Klamath Mountains of southwestern Oregon and northwestern California. In *C. arachnoidea typica* I would now include *C. schizotricha* Greenm., *C. eastwoodiana* Pennell, and *C. floccosa* Pennell, the last of which was inadvertently proposed as I had already elsewhere chosen the name *eastwoodiana*. To the southeastward of *typica*, on Mount Shasta and Scott Mountains, Siskiyou County, California, is a somewhat different alpine, long ago designated by Miss Alice Eastwood as distinct but never actually described.

C. arachnoidea shastensis (*C. shastensis* Eastw. ex Baker, West. Amer. Plants,⁸ 3: 4, 1904, nomen nudum) differs from *typica* by its bracts, calyces, and lower corolla-lobes being distally dull red (instead of yellow or merely reddish at tip), its bracts less appressed and ascending-spreading, and its inflorescence less wooly. (Bracteae, calyces, et corollae lobi inferiores ad apices hebetes rubri, bracteis adscendenti-patentibus, inflorescentiâ minus lanosâ.)

As type I designate a specimen from sand flats at 7000 feet altitude on Mount Shasta, California, collected in flower and fruit August 18, 1941 by William Bridge Cooke, no. 16188, and preserved in the herbarium of the Academy of Natural Sciences of Philadelphia.

2. *Castilleja villicaulis* Pennell & Ownbey sp. nov.

Plant perennial, villose-pubescent, especially on the stem. Root heavy, the stems many, 1-2.5 dm. tall, simple or branched. Leaves linear or linear-lanceolate, entire or the upper with a pair of slender lobes. Bracts and calyces yellowish, the former shorter and wider than the leaves and with 2 pairs of slender lobes. Calyx becoming 13 mm. long, cleft medianly nearly $\frac{1}{2}$ length, laterally only 0.5-1 mm. into acutish or rounded lobes. Corolla 13-14 mm. long: its galea 5 mm. long, attenuate, puberulent, with narrow pale thin margins; its lower lip 3-4 mm. long, proximally not inflated, distally with thickened greenish puberulent lobes. Capsule 8 mm. long.

Perennis; caulis villosus-pubescent, 1-2.5 dm. altus; folia linearia vel lineari-lanceolata, integra vel superiora lineari-lobata; bracteae latiores magis lobatae flavescentes; calyx 13 mm. longus flavescent mediane fere $\frac{1}{2}$, latere minus quam $\frac{1}{2}$ fissus, lobis acutiusculis rotundatisve; corolla 13-14 mm. longa, galeâ 5 mm. longâ dorso puberulente marginibus pallidâ, labio inferiore 3-4 mm. longo non inflato in lobos virides exeunte; capsula 8 mm. longa.

Type, on light volcanic soil, about 2100 meters altitude, Mount Paddo (Adams), Washington, collected in flower and fruit July 30, 1906, by Wil-

⁸ C. F. Baker's "Western American Plants", although divided into several numbered installments, consisted of mere lists of species available for distribution, so that the novelties lacked accompanying descriptions.

helm N. Suksdorf, no. 5767; in herbarium of Academy of Natural Sciences of Philadelphia.

It is most fitting that Dr. Marion Ownbey, who has shown such interest in *Castilleja* and who is curator of the herbarium at Pullman, Washington, that contains the primary series of Suksdorf's collections, should join me in describing this new species. No mountain flora has been more enthusiastically described than was that of Mount Adams by Suksdorf, as he knew it before its fearful despoiling by the pasturing of sheep. This peak, so near to Mount Rainier, is also remarkable for the considerable number of its endemic plants.

Castilleja villicaulis, peculiar to the alpine slopes of Mount Adams, is most closely related to *C. cryptantha* Pennell & Jones,⁹ similarly restricted to Mount Rainier. Whether it is likewise habitually self-pollinated, demands field-observation. The two may be distinguished as follows:

- A. Bracts and calyces yellowish; calyx-lobes shorter than wide, acutish to rounded; stems many, 1-2.5 dm. tall, densely white-villose. *C. villicaulis*
- AA. Bracts greenish to vinaceous brown, against which contrast the yellow calyces; calyx-lobes as long as wide, acute to obtuse or slightly rounded; stems few or solitary, 1-1.5 dm. tall, somewhat villose-hirsute. *C. cryptantha*

3. *Castilleja thompsoni* sp. nov.

Plant perennial, pilose with spreading hairs and also closely pubescent with shorter recurved or appressed hairs, not glandular. Root stout, descending. Stems many, simple or somewhat branched, erect, 1-3 dm. tall. Leaves ascending, 3-ribbed, linear-lanceolate, entire or with 1 or 2 pairs of slender lobes, the main leaves 4 cm. long, 2-3 mm. wide. Fruiting inflorescence becoming 9-13 cm. long. Bracts and calyces distally yellowish, the former much shorter and wider than the leaves and with 2 pairs of lobes. Pedicels less than 1 mm. long. Calyx 15-23 mm. long, cleft medianly equally 4-5 mm., laterally only 0.5-2 mm. into obtuse to rounded lobes. Corolla 18-27 mm. long: its galea 5-7 mm. long, dorsally green and puberulent, ventrally with wide whitish thin margins; its lower lip 3-5 mm. long, proximally pale and slightly inflated, distally with white oblong rounded appressed lobes. Capsule 10 mm. long, narrowly ellipsoid-ovoid. Seeds not seen.

Perennis, hirsuto-pubescent; caulis 1-3 dm. altus; folia lineari-lanceolata, integra vel lineari-lobata; bractee latiores lobatae flavescentes; calyx 15-23 mm. longus flavescens mediane $\frac{1}{2}$, latere minus quam $\frac{1}{2}$ fissus, lobis obtusis rotundatisve; corolla 18-27 mm. longa, galea 5-7 mm. longa dorso puberulenta marginibus latis albidis, labio inferiore 3-5 mm. longo parum inflato in lobos albos exeunte; capsula 10 mm. longa.

Type, dry sagebrush slopes near Coulee City in Grand Coulee, Grant County, Washington, collected in flower May 18, 1935, by J. William Thompson, no. 11512; in herbarium of Academy of Natural Sciences of Philadelphia. I take pleasure in naming this species of the interior Colum-

⁹ Proc. Biol. Soc. Washington, 50: 208, 1937.

bia River valley of eastern Washington for Mr. Thompson, whose many collections are contributing greatly to our knowledge of the flora of the north-western United States.

Of the alliance of *Castilleja pallescens* (Nutt.) Greenm. and *C. cervina* Greenm. *C. pallescens* differs from both the others by having appressed hairs on the herbage, narrower leaves and leaf-segments, and more pubescent pouch of the lower corolla-lip. From *C. cervina* of the upper Columbia River valley *C. thompsoni* may be distinguished as follows:

- A. Stem and leaves finely pubescent, the former mostly 3-6 dm. tall, the latter linear or linear-lanceolate with mid-blade mostly 1-1.5 mm. wide; bracts relatively narrow and leaf-like, the mid-blade 3-4 mm. wide, acutish or acute, and usually with 2 pairs of narrowly linear lobes; pouch of lower corolla-lip purplish. ... *C. cervina*
- AA. Stem and leaves hirsute, the former mostly 1.5-3 dm. tall, the latter broadly linear with mid-blade mostly 1.5-3.5 mm. wide; bracts relatively wide, the mid-blade 3.5-5 mm. wide, obtusish to rounded, and usually with 2 pairs of linear or widely linear lobes; pouch of lower corolla-lip pale yellowish green to slightly purplish. *C. thompsoni*

4. *Castilleja ownbeyana* sp. nov.

Plant perennial, the densely clustered stems 1-1.5 dm. tall. Stem villose-hirsute with spreading glandless hairs. Leaves villose-pubescent on both surfaces, lanceolate, entire or with a pair of ascending-spreading lobes, attenuate, 1.5-2 cm. long, proximally 3-5 mm. wide. Bracts and calyces distally yellowish or purplish. Bracts shorter and wider than leaves, villose-hirsute, the mid-blade ovate-lanceolate, obtuse or obtusish at apex, with a pair of linear-lanceolate lobes. Calyx in anthesis 15-16 mm. long, cleft medianly about $\frac{1}{2}$ length, laterally 0.5-1 mm. into rounded lobes. Corolla 16-17 mm. long: its galea 6-7 mm. long, acute, green, puberulent, with wide thin purple margins; its lower lip 4-5 mm. long, appressed (proximally scarcely or not pouched), the lobes lance-oblong, purple, 2 mm. long. Anthers included within galea. Stigma 1 mm. wide, green, much wider than long, becoming exserted beyond tip of galea. Capsule 7-8 mm. long, ovoid, acuminate. Seeds oblong, 1.2 mm. long.

Perennis; caulis 1-1.5 dm. altus, villosio-hirsutus; folia villosio-pubescentia, lanceolata, integra vel paucilobata, attenuata; bracteae breviores et latiores flavescens vel purpurascens; calyx 15-16 mm. longus, flavescens purpurascens, mediane $\frac{1}{2}$, latere minus quam $\frac{1}{2}$ fissus, lobis rotundatis, corolla 16-17 mm. longa, galea 6-7 mm. longa dorso puberulente marginibus latis purpureis, labio inferiore 4-5 mm. longo vix aut non inflato in lobos purpureos exeunte; capsula 7-8 mm. longa.

Type, "moist alpine Wallowa Mts. near the lake", evidently in Wallowa County, Oregon, collected in flower and fruit August 2, 1899, by William C. Cusick, no. 2354; in herbarium of State College of Washington (no. 23495).

I take pleasure in naming this species for Dr. Marion Ownbey of the State College of Washington, who has taken such keen interest in the western species of *Castilleja* and who sent for my inspection the specimens on which it has been based. Beside 2354, which has been chosen for type, there are

also Cusick's numbers 2449a and 2457a, both from the head of Keystone Creek, presumably also in the Wallowa Mountains.

From *Castilleja chrysantha* Greenm. of the Wallowa and Elkhorn Mountains this may be distinguished by its more puberulent galea, its relatively longer lower corolla-lip, its greater hairiness, and its dull yellowish or purplish (rather than greenish white to light yellow) bracts. From *C. lemmoni* Gray and *C. culbertsoni* Greene of the Sierra Nevada of California, it differs in its flowers, little exceeding the foliose bracts, the width and coarse hairiness of its leaves and bracts, and its diffusely ascending (rather than decumbent) habit.

5. *Castilleja wherryana* sp. nov.

Plant perennial, the base woody, the clustered stems simple or branched, 3-6 dm. tall, the herbage closely glandular-pubescent and pilose with interspersed glandless hairs. Leaves lanceolate, 3-ribbed, acute or obtuse, entire or distally with a pair of spreading lobes, the main leaves 3-6 cm. long, 4-8 mm. wide. Inflorescence pilose-hirsute, becoming 8-12 cm. long. Bracts and calyces distally scarlet. Pedicels becoming 2 mm. long. Calyx 15-17 mm. long, cleft medianly equally 4-5 mm., laterally 1.5-2 mm. into lanceolate-attenuate lobes. Corolla 13-15 mm. long, decurved: its galea 8-10 mm. long, slender, dorsally greenish and glandular-puberulent (the median hairs longer and glandless), with thin reddish glabrous margins; its lower lip 1.5 mm. long, dark green, protuberant with the rudimentary lobes incurved. Anthers yellow, becoming loosely exerted. Stigma 0.3 mm. wide, dark grey, exerted from tip of galea. Capsule 13-14 mm. long, narrowly ellipsoid-ovoid. Seeds 1.5 mm. long, ellipsoid-ovoid, with loose strongly reticulate testa.

Perennis, glandulari-pubescent; caulis 3-6 dm. altus; folia lanceolata, integra vel paucilobata, acuta obtusave; bracteae valde lobatae, coccineae; calyx 15-17 mm. longus, coccineus, mediane fere $\frac{1}{3}$, latere minus quam $\frac{1}{3}$ fissus, lobis lanceolato-attenuatis; corolla 13-15 mm. longa, galea 8-10 mm. longa dorso glandulari-puberulente marginibus rubescentibus, labio inferiore 1.5 mm. longo viride in lobos rudimentarios exeunte; capsula 13-14 mm. longa.

Type, open pine woods on sandstone, at 5000 feet altitude, Dooley Mountain, south of Salisbury, Baker County, Oregon, collected in flower and fruit July 4, 1931, by Francis W. Pennell, no. 15454; in herbarium of Academy of Natural Sciences of Philadelphia. This collection was made in company with Dr. Edgar T. Wherry of the University of Pennsylvania to whom it is dedicated.

This species of the lower mountains of eastern central Oregon accords with *Castilleja breweri* Fernald of the Sierra Nevada of California in its glandular indumentum, in the lower corolla-lip being only about $\frac{1}{3}$ the length of the upper, and in the bracts being bright red. But they are not closely related, and may be distinguished as follows:

- A. Galea dorsally glandular-puberulent, relatively slender; leaves lanceolate, acute; plant 3-4 dm. tall, hirsute, with glandless and also with shorter gland-tipped hairs. *C. wherryana*
- AA. Galea dorsally with glandless or nearly glandless hairs, relatively stout; leaves oblong-lanceolate and obtuse to mostly lance-attenuate; plant 1-2 dm. tall, with similar or with less differentiated indumentum. *C. breweri*

Castilleja latifolia and its relatives

This association of species, which may be termed the Latifoliae, pertains to coastal California, Oregon, and Washington. Its distinguishing characteristics, in contrast with most species that have the lower corolla-lip reduced to a green rudiment, are the strong hairiness of the upper surface of the galea and the woodiness and considerable branching of the lower part of the stem. Miss Alice Eastwood, in Leaflets of Western Botany (1:236-238, 1936), has made some study of the group, but, in contrast to her usual course, has placed what seem to me several species as varieties of *C. latifolia* itself. As these units seem to me constantly distinct and to possess more characters than she has noticed, I propose to distinguish all the members of this alliance as follows:

- A. Hairs of leaves and stems simple; calyx-lobes rounded to abruptly acuminate; corollas exceeding the colored bracts (except in *C. episcopalís*). B
- AA. Hairs of leaves branched, those of the stem mostly simple and many gland-tipped; calyx-lobes acute; corolla about equaling the green or greenish bracts. ... *C. mollis*
- B. Leaves oblong-lanceolate, at least thrice as long as wide; bracts and calyces yellow or red, the bracts all deeply trifid; plant slightly to moderately pubescent or hirsute-pubescent, ascending to erect. C
- BB. Leaves oblong to orbicular, rounded, less than thrice as long as wide; bracts and calyces scarlet-red to scarlet, distad to the yellow cross-band; plant hirsute or villose-hirsute with glandless hairs, diffusely spreading. F
- C. Corolla 12-15 mm. long, not or scarcely exceeding the bracts which bear lobes widely spreading (to 90°); calyx 10-12 mm. long; inflorescence becoming 30 cm. long; leaves thickened, the upper ones about thrice as long as wide. *C. episcopalís*
- CC. Corolla larger, exceeding the bracts which bear lobes ascending-spreading (less than 90°); calyx 17-22 mm. long; inflorescence rarely over 20 mm. long (except occasionally in *C. litoralis*); main cauline leaves usually at least 4 times as long as wide. D
- D. Herbage, below the inflorescence, with gland-tipped hairs interspersed sparingly to abundantly among the glandless ones; plant more uniformly hairy; bracts yellow to red; leaves of abbreviated shoots much developed. *C. wightii*
- DD. Herbage, below the inflorescence, not glandular; plant loosely hirsute-pubescent to glabrous; bracts scarlet. E
- E. Calyx-tube not inflated, light yellowish green, cleft laterally much less than medianly; leaves thick, oblong-lanceolate to widely oblong, finely (or rather coarsely) pubescent to glabrous, those of the axillary shoots little or not developed. *C. litoralis*
- EE. Calyx-tube somewhat inflated, less strongly angled, pale yellow, cleft laterally little less than medianly; leaves apparently thin, oblong-lanceolate to narrowly oblong, greyish-pubescent, those of the axillary shoots usually so developed as to make the plant densely leafy. *C. inflata*

- F. Bracts all 3-lobed, the mid-lobe rounded and the lateral ones diverging about 45°; corolla 29-32 mm. long, its lower lip often spreading and the stout galea projecting 7-12 mm. beyond the calyx; plant villose-hirsute, the leaves mostly 1.3-2.5 cm. long and the depressed stems slightly woody. *C. mendocinensis*
- FF. Bracts not (or scarcely) lobed, truncate rounded; corolla 24-27 mm. long, its lower lip appressed and the relatively slender galea projecting 4-5(-10) mm. beyond the calyx; plant more stiffly hirsute, the leaves mostly 1-2 cm. long and the diffuse or erect stems thicker and quite woody. *C. latifolia*

6. *Castilleja episcopalis* sp. nov.

Base not collected, but plant certainly perennial. Stems branched, 6 dm. or more tall, bifariously sparsely or finely puberulent. Lower and main leaves already fallen in plant seen, but the upper lance-oblong, rounded at apex, entire, pubescent with short stiff glandless hairs, mostly 1.5-2 cm. long, 4-5 mm. wide. Inflorescence narrowly elongated, reaching 30 cm. or more long, the bracts and calyces distally scarlet. Bracts 1.2-1.8 cm. long, pubescent on both surfaces with glandless and with shorter interspersed gland-tipped hairs, the mid-portion as wide as or wider than the upper leaves and equally rounded, and with a pair of ascending-spreading lanceolate obtuse lobes. Pedicels becoming 1-2 mm. long. Calyx 10-12 mm. long, cleft medianly equally 4-5 mm., laterally 2 mm. into broadly rounded lobes. Corolla 12-15 mm. long: its galea 8-10 mm. long, dorsally green and hirsutulous-pubescent with glandless (or distally slightly gland-tipped) hairs, ventrally with thin pale (or perhaps reddish) glabrous margins; its lower lip 2 mm. long, thickened, dark green, its appressed-incurved lobes rudimentary. Anthers included. Stigma 0.5-0.7 mm. wide, becoming somewhat exerted from tip of galea. Capsule 12-13 mm. long, cylindric-ovoid. Seeds 2-2.5 mm. long, irregularly rectangular, with loose strongly reticulate testa.

Caulis saltem 6 dm. altus, multiramosus, bifariam puberulus; folia superiora lanceolato-oblonga, rotundata, integra, pubescentia; inflorescentia elongata, usque ad 30 cm. longa; bracteae integrae vel trifidae, coccineae; calyx 10-12 mm. longus, coccineus, mediane $\frac{2}{3}$, latere $\frac{1}{3}$ ad $\frac{1}{2}$ fissus, lobis rotundatis; corolla 12-15 mm. longa, galea 8-10 mm. longa dorso hirsutulo-pubescente marginibus pallescentibus (vel forsitan rubescentibus); labio inferiore 2 mm. longo viride in lobos rudimentarios exeunte; capsula 12-13 mm. longa.

Type, chaparral, at 300 feet altitude, along shore road 14 miles north of San Carpio which is north of San Simeon, San Luis Obispo County, California, collected in fruit and late flower August 21, 1940, by Francis W. Pennell, no. 26462; in herbarium of Academy of Natural Sciences of Philadelphia.

I deeply regret that at the time of collecting this plant I did not realize its distinctness, and so failed either to make field notes concerning it or to gather sufficient specimens for distribution. Presumably it pertains to this steep portion of coast.

7. *Castilleja wightii* Elmer

This species of the vicinity of San Francisco Bay, California, was ac-

counted a variety of *Castilleja latifolia* by Miss Zeile in her revision of *Castilleja* for Jepson's "Manual of the Flowering Plants of California" (p. 937) in 1925. *C. latifolia wightii* was applied by Miss Eastwood in 1936 to the more viscid state, while *C. l. pinnatifida* was also proposed by her for another glandular subspecies from the Berkeley Hills of Alameda County. Both descriptions seem to pertain to the usually dull-bracted plant that I consider *C. wightii typica*, as do also Miss Eastwood's *C. inornata* (in Leaf. West. Bot., 3: 90, 1941) from the coast of Sonoma County north of Bodega, and *C. uliginosa* (in Leaf. West. Bot., 3: 117, 1942) from Pitkin Marsh, Sonoma County. The bracts and calyces distally are merely yellowish or reddish.

In apparent contrast is a plant with much brighter color, although I suspect that it will ultimately prove to be better considered as a mere color-form. However, that it may have recognition in Abrams' "Illustrated Flora", I account it a subspecies, *Castilleja wightii rubra*, with characters as follows:

Bracts and calyces distally bright red, the latter with lobes usually more rounded; and corolla rather larger, usually 23-28 mm. long, the inflorescence less crowded and more slender. (Bracteae et calyces rubrae, calycis lobis rotundioribus; corolla saepissime 23-28 mm. longa, et inflorescentia gracilior.)

As type I designate a specimen from woods on shale, at 150 to 250 feet altitude, west of Fairfax, Marin County, California, collected in flower May 20, 1940, by F. W. Pennell and J. T. Howell, no. 25452, and preserved in the herbarium of the Academy of Natural Sciences of Philadelphia.

8. *Castilleja litoralis* sp. nov.

Plant perennial, glandless. Stems several, suffrutescent only at base, ascending or erect, 3-9 dm. tall, branched, hirsute in inflorescence and either also somewhat so toward base or else wholly glabrous below the inflorescence. Leaves usually oblong (varying from linear- to ovate-oblong), entire, rounded at apex, scabro-pilose to glabrescent on both surfaces, 3-8 cm. long, 5-20 mm. wide. Inflorescence becoming 10-25 cm. long, the bracts and calyces distally scarlet or scarlet-red. Lower bracts entire, similar to, and little smaller than, the upper foliage-leaves, the upper bracts deeply cleft, with mid-lobe rounded and the single pair of lateral lobes ascending-spreading and linear-lanceolate. Pedicels becoming 1-2 mm. long. Calyx 20-25 mm. long, cleft medianly equally 7-10 mm., laterally 1-4 mm. into rounded ovate lobes. Corolla 25-30 mm. long, decurved: its galea 13 mm. long, dorsally yellowish green and villose-pilose, ventrally with wide red glabrescent margins; its lower lip 2 mm. long, dark green to dark violet, protuberant, with rudimentary lobes. Anthers and stigma becoming exerted, the former yellow, the latter dark grey, 0.5 mm. wide. Capsule 13 mm. long, nearly ovoid. Seeds 2 mm. long, rectangular, with loose strongly reticulate testa.

Perennis; caulis 3-9 dm. altus, ramosus, in inflorescentiā hirsutus; folia saepissime oblonga, integra, rotundata; bracteae inferiores integrae, superiores trifidae, coccineae; calyx 20-25 mm. longus, mediane $\frac{1}{3}$ ad $\frac{2}{3}$, latere minus quam $\frac{1}{3}$ fissus, lobis ovatis rotundatis; corolla 25-30 mm. longa, galea 13 mm. longā dorso villosa-pilosa marginibus latis rubris, labio inferiore 2 mm. longo atrovirede aut atroviolaceo in lobos rudimentarios exeunte; capsula 13 mm. longa.

Type, sandy cliff facing ocean, Bandon, Coos County, Oregon, collected in flower July 19, 1931 by Francis W. Pennell, no. 15651; in herbarium of Academy of Natural Sciences of Philadelphia.

Sandy seashore bluffs, Washington to northern California.

9. *Castilleja inflata* sp. nov.

Plant perennial, glandless. Stems several, suffrutescent only near base, decumbent and ascending, 3-4 dm. tall, much branched and densely foliose, villosa-hirsute in the inflorescence and sparsely to strongly hirsute-pilose on stem below inflorescence. Leaves with mid-blade usually oblong, entire or with 1 or 2 pairs of narrow lobes, rounded at apex, pubescent on both surfaces with spreading or recurved hairs, the main leaves 2.5-4 cm. long, 4-5 mm. wide. Inflorescence becoming 10-15 cm. long (or perhaps longer), the bracts and calyces distally scarlet-vermilion. Bracts shorter and wider than leaves, mostly lobed. Pedicels 1-2 mm. long. Calyx 21-23 mm. long, its tube proximally pale yellow and somewhat inflated, cleft medianly equally 7-9 mm. long, laterally scarcely less deeply into rounded oblong lobes (the mid-posterior sometimes present, lanceolate-subulate, 3 mm. long). Corolla 25 mm. long, slightly decurved; its galea 13-14 mm. long, dorsally green and pubescent with glandless hairs (hirsute medianly), ventrally with wide reddish glabrous margins; its lower lip 1-2 mm. long, protuberant, green, rudimentary. Anthers and stigma becoming exerted, the former yellow, the latter grey, 2-lobed, 0.8-1 mm. wide. Capsule 14 mm. long, nearly ovoid.

Perennis; caulis inferne suffruticosus, decumbens ascendensque, 3-4 dm. altus, ramosissimus et foliosissimus, in inflorescentiā villosa-hirsutus; folia saepissime oblonga, integra vel lobata, rotundata; bracteae foliis breviores et latiores, coccineae; calyx 21-23 mm. longus, tubo inflatus, mediane et latere $\frac{1}{3}$ fissus, lobis oblongis rotundatis lobo supremo interdum praesente; corolla 25 mm. longa, galea 13-14 mm. longā dorso hirsuto-pubescente marginibus latis rubescentibus, labio inferiore 1-2 mm. longo protuberante viride rudimentario; capsula 14 mm. longa.

Type, sandy soil over granite, headland, at 400 to 500 feet altitude, Point Reyes, Marin County, California, collected in flower May 20, 1940 by F. W. Pennell and J. T. Howell, no. 25473; in herbarium of Academy of Natural Sciences of Philadelphia.

A very localized and remarkable species.

10. *Castilleja mendocinensis* (Eastw.) comb. nov.

Based upon *Castilleja latifolia mendocinensis* Eastw. (in Leaf. West.

Bot., 1: 238, 1930), collected by Miss Alice Eastwood at Mendocino City in 1922. This occurs on sandy shore bluffs of Mendocino and Humboldt counties, California. It is closely related to *C. latifolia*, but is distinct in its characters and in its geographic isolation.

11. *Castilleja latifolia* Hook. & Arn.

Described by Hooker and Arnott in "The Botany of Captain Beechey's Voyage" (p. 154, 1830), this is among the plants from California that were "collected at San Francisco, and a few at Monterey Bay". Hooker and Arnott, and subsequent authors including Miss Eastwood (in *Leafl. West. Bot.*, 1: 237, 1936), have naturally attributed it to San Francisco, but specimens matching its type are, so far as I am aware, not found there, but it can be fully matched in specimens of the plant peculiar, and also restricted, to the sandy coast of the Monterey peninsula. So I think that the type, evidently collected by Alexander Collie, must have been one of the few plants from Monterey.

Collie described the plant as "from three to six inches high", and said that it "grows in wet sandy places". The last characterizes well the habitat, but the former remark, as well as the account of the stem as "caule subherbaceo", suggests that he noted smaller, and presumably younger, plants. Such, so far as my observations go, as seen in collections such as Heller 6806 from Carmel Bay and my own 26019 from Pacific Grove, are more apt to show the bracts somewhat three-lobed. Older plants grow to more than twice that height, are very woody and much branched with the herbaceous shoots of the season relatively short, and have the bracts mostly or wholly entire. The original description fits only this species (but in relatively young material) in saying of the bracts: "foliis . . . floralibus dilatatis cuneatis apice trifidis lobis brevibus obtusis medio latiori." (The leaves of the San Francisco relative, *C. wightii*, would be too long and narrow, and the bracts much too deeply cut to meet this characterization.)

Castilleja latifolia has been subsequently described as *C. macrocarpa* Benth. (*Scroph. Indicae*, 13, 1835), based upon a collection by David Douglas; and as *C. latifolia carmelensis* Eastw. (in *Leafl. West. Bot.*, 1: 237, 1936), based upon a collection by E. K. Abbott. Both describe admirably the plant of the Monterey sands.

11. *Castilleja mollis* sp. nov.

Plant shrubby, at least 3 dm. tall, diffusely much branched (and with short axillary leafy shoots). Stem villose-hirsute (especially in inflorescence) with spreading glandless and partially gland-tipped hairs. Leaves oblong, entire, distally rounded, proximally slightly narrowed to the rounded sessile bases, those of the main stem 1.5 cm. long, 7-8 mm. wide, those of the axillary shoots much smaller, the leaves pale green and softly covered

by a tomentum of branched and mostly glandless hairs. Bracts obovoid, distally rounded or 3-toothed, pale green or slightly yellowish, the larger 1.5-2 cm. long, 10 mm. wide. Calyx 16-17 mm. long, cleft medianly 7 mm., laterally 2 mm., the free lobes ovate, acute. Corolla 17-18 mm. long, only the tip of the galea exerted: its galea 7-8 mm. long, truncate, green, dorsally hirsute-pubescent, with wide thin pale margins; its lower lip 2 mm. long, appressed, green, rudimentary. Anthers becoming extruded beneath galea-tip. Stigma 0.5 mm. wide, 2-lobed, dark green, exerted slightly beyond galea-tip. Capsule not seen.

Fruticosa; caulis saltem 3 dm. altus, ramosissimus, ramis axillaribus brevibus et foliosis, villosa-hirsutus, pilis patentibus et glandulosis et eglandulosis; folia oblonga integra rotundata pilis ramosis molliter tomentosa; bracteae obovoideae rotundatae integrae vel 3-dentatae ochroleucae vel viridescens; calyx 16-17 mm. longus, mediane magis quam $\frac{2}{3}$, latere $\frac{1}{2}$ fissus, lobis ovatis acutis; corolla 17-18 mm. longa, galea 7-8 mm. longa dorso hirsuto-pubescente marginibus latis pallescentibus, labio inferiore 2 mm. longo viride adpresso rudimentario; capsula non visa.

Type, sandy upland, N. Vail Ranch, Santa Rosa Island, Santa Barbara County, California, collected in flower August 6, 1939 by M. B. Dunkle, no. 8489; in herbarium of Los Angeles County Museum, with photograph at Academy of Natural Sciences of Philadelphia.

Species in habit, bracts, and hirsute galea like *Castilleja latifolia* and its relatives, but in its tomentum of branched hairs agreeing with *C. lanata*, *C. foliolosa*, and their relatives. In the acuteness of the calyx-lobes it differs from both these groups.

12. *Castilleja gyroloba* sp. nov.

Plant perennial, pubescent with spreading glandless and with shorter gland-tipped hairs, the stems several, 3-6 dm. tall, erect or ascending, suffrutescent at base or wholly herbaceous, slightly more hirsute in inflorescence. Leaves lanceolate or oblong-lanceolate, acute or obtuse, entire or occasionally distally lobed, undulate, 3-ribbed, the larger 3-6 cm. long, 5-13 mm. wide. Inflorescence becoming 10-15 cm. long, the bracts and calyces distally scarlet or scarlet-red, abruptly from yellow cross-zone. Bracts with a pair of ascending-spreading lobes, all segments rounded. Pedicels very short. Calyx 15-25 mm. long, cleft medianly equally nearly $\frac{1}{2}$ length, laterally 2-3 mm. into rounded lobes. Corolla usually 25-35 mm. long, decurved: its galea 15-24 mm. long, dorsally yellowish green and minutely pubescent or puberulent, with reddish thin glabrous margins; its lower lip 1.5-2 mm. long, dark green, protuberant-incurved, rudimentary. Anthers and stigma becoming exerted beyond tip of galea, the former yellow, the latter green, somewhat 2-lobed, 0.5-1 mm. wide. Capsule 12-13 mm. long, narrowly to ellipsoid-ovoid.

Perennis, pubescens, pilis patentibus et eglandulosis et brevioribus glandulosis; caulis 3-6 dm. altus, ramosus, basi suffrutescens vel omnino herbaceus; folia lanceolata vel oblongo-lanceolata, plerumque integra; bracteae rotundatae trifidae coccineae lineis flavis singulis transversis notatae; calyx 15-25 mm. longus, mediane fere $\frac{1}{2}$, latere circa $\frac{1}{3}$ fissus, lobis

rotundatis; corolla plerumque 25-35 mm. longa, galeā 15-24 mm. longā dorso puberulente marginibus rubescentibus, labio inferiore 1.5-2 mm. longo atroviride protuberanti-incurvo rudimentario; capsula 12-13 mm. longa.

Type, open oak forest on sandy loam, at 2800-3000 feet altitude, near Oak Flat Camp, on Route 99, north of Los Angeles, Los Angeles County, California, collected in flower April 18, 1940 by Francis W. Pennell, no. 25140; in herbarium of Academy of Natural Sciences of Philadelphia.

Occurs in chaparral and oak woodland through the Inner Coast Ranges from Lake and Yolo to San Diego counties, California.

Castilleja gyroloba, so characteristic of these mountain ranges, appears to have escaped description although recent collectors have been aware of it and have been calling it *C. roseana*. But inspection of Miss Eastwood's type of that, which came from Monterey County, shows it to have the narrow strongly wavy leaves and the lanceolate calyx-lobes of *C. applegatei*. This seems to be also the case with *C. hoffmannii* Eastw., from Mt. Pinos, Ventura County, the narrow strongly wavy leaves and the acute or acutish (to barely obtuse) calyx-lobes again denoting *C. applegatei*, although the size of the corollas (30-35 mm. in length) may suggest some approach to our plant. It seems to me, however, best regarded as the most southern element of *C. applegatei*.

This group of species, comprising *Castilleja applegatei* Fernald, occurring from central Oregon south to Inyo and Ventura counties, California; *C. ewanii* Eastw., in the San Bernardino Mountains of southern California; *C. martini* Abrams, from the mountains of Los Angeles to San Diego county, California; and *C. gyroloba*, may be distinguished as follows:

- A. Calyx-lobes obtuse to usually rounded; corolla usually 25-35 mm. long, the stout galea conspicuously exerted; leaves linear to oblong-lanceolate, entire or the upper deeply trifid. *C. gyroloba*
- AA. Calyx-lobes acutish to attenuate; corolla usually 20-30 mm. long and with less conspicuously exerted galea.
 - B. Lobes of corolla not or scarcely longer than wide, 0.5-2 mm. long, ovate or wider.
 - C. Leaves lanceolate or widely lanceolate, undulate, densely villose-pubescent; plant less densely glandular, the gland-tipped hairs mostly hidden by the villose glandless hairs. *C. martini*
 - CC. Leaves linear-lanceolate, plane or somewhat undulate, shortly hispid-pubescent (especially ciliate); plant more densely glandular-pubescent, especially with short hairs on leaf-surfaces. *C. ewanii*
 - BB. Lobes of calyx much longer than wide, 2-4 mm. long, linear or lanceolate; leaves linear-lanceolate, wavy-margined. *C. applegatei*

13. *Castilleja oreopola* Greenman

This beautiful alpine species of the northwestern United States appears to fall into three subspecies, each endemic to a different mountain area. They are distinguishable by size of flowers and color of the bracts and calyces.

- A. Bracts rose-red to red; corolla becoming 20-23 mm. long; leaf-blades relatively wide, those of the middle portion of the stem 4-9 mm. wide. *C. o. typica*
 AA. Bracts mallow purple; corolla becoming 17-20 mm. long; leaf-blades narrower, those of the middle portion of the stem 3-6 mm. wide. *C. o. olympica*
 AAA. Bracts whitish or dull yellowish; corolla becoming 12-17 mm. long; leaf-blades of mid-stem 2-5 mm. wide. *C. o. albida*

Castilleja oreopola typica (*C. oreopola* Greenm. in Bot. Gaz., 25: 264, 1898), originally described from Mount Adams, Washington, occurs in alpine meadows and glades of coniferous forest through the Cascade Range from Mount Rainier, Washington to Three Sisters Peak, Oregon.

Castilleja oreopola olympica subsp. nov. (bracteis purpureis, corollā 17-20 mm. longā, foliis mediis 3-6 mm. latis) occurs in similar environments on the Olympic Mountains of western Washington.

Type, rocky sandstone ridge, at 3900 to 4000 feet altitude, on Bogachiel Ridge, above Sol Duc Hot Springs, Clallam County, Washington, collected in flower and fruit August 9, 1937, by F. W. Pennell and F. G. Meyer, no. 21237; in herbarium of Academy of Natural Sciences of Philadelphia.

Castilleja oreopola albida subsp. nov. (bracteis albidis vel ochroleucis, corollā 12-17 mm. longā, foliis mediis 2-5 mm. latis) occurs through the northernmost Cascade Range from Mount Stuart to Mount Baker, Washington, and to the Green Mountains of southern British Columbia.

Type, alpine slopes of Mount Pugh, Snohomish County, Washington, at 7000 feet altitude, collected in flower and fruit August 18, 1938 by J. William Thompson, no. 14353; in herbarium of Academy of Natural Sciences of Philadelphia.

14. *Castilleja franciscana* sp. nov.

Plant perennial, pilose-pubescent with recurved glandless hairs, the inflorescence more hairy, slightly villose-hirsute. Stems several, herbaceous, suffrutescent at the decumbent base, simple or somewhat branched, 3-7 dm. tall. Leaves linear-lanceolate to lanceolate, entire or with a pair of slender lobes. Bracts distally and calyces scarlet or scarlet-red, or somewhat duller (between carnelian- and grenadine-red). Bracts shorter than leaves, entire or with a pair of short distally directed lobes, obtuse. Calyx becoming 25-35 mm. long (its tube decurved), cleft medianly more deeply ventrally ($\frac{1}{2}$ length) than dorsally ($\frac{1}{3}$ to $\frac{1}{2}$ length), laterally 3-5 mm. into linear- to oblong-lanceolate lobes which upcurve from the decurving galea. Corolla 35-45 mm. long (exceeding calyces and bracts): its galea 20-25 mm. long, stout, yellowish green, pubescent dorsally, with wide yellow or reddish thin margins; its lower lip 3 mm. long, dark green, rudimentary, appressed. Capsule at least 10 mm. long.

Perennis, pilis eglandulosis recurvis pubescens sed in inflorescentiā villosa-hirsuta; caulis 3-7 dm. altus, simplex vel ramosus; folia lineari-lanceolata vel lanceolata, integra vel lobata; bractee angustae, integrae vel distaliter 3-lobatae, coccineae; calyx 25-35 mm. longus, coccineus, mediane postice $\frac{1}{2}$ - $\frac{1}{3}$ et antice $\frac{1}{2}$, sed latere $\frac{1}{2}$ - $\frac{1}{3}$ fissus, lobis lineari- vel oblongo-lanceolatis; corolla 35-45 mm. longa, galeā 20-25 mm. longā dorso pubes-

cente marginibus latis flavis vel rubescentibus, labio inferiore 3 mm. longo atroviride adpresso rudimentario; capsula saltem 10 mm. longa.

Type, dark adobe clay, at 200 to 300 feet altitude, on roadbank east of upper Crystal Springs Lake, southwest of San Mateo, San Mateo County, California, collected in flower May 15, 1940, by F. W. Pennell and D. D. Keck, no. 25420; in herbarium of Academy of Natural Sciences of Philadelphia.

In chaparral and other bushy growth, along the coast from Mendocino to Ventura counties, California.

This has long been identified as *Castilleja affinis* Hook. & Arn., which was collected by Lay or Collie (presumably the latter) in California in 1827, most probably at San Francisco but possibly at Monterey. Fortunately, the type of that species survives at Kew Gardens, where I studied it in 1930 and also obtained a photograph of it for the herbarium of this Academy. My notes state that the calyx was cleft equally anteriorly and posteriorly, thus showing that it is not the species with which the name has long been associated. (The corollas, reaching more than 40 mm. long and with quite pubescent galeas, the elongated narrow leaves, and the stem white-hairy proximally, denote a little-recognized species that occurs through much of California.) The mis-identification of *C. affinis* seems to have commenced with Bentham's inclusion¹⁰ of it in his section *Callichroma*, distinguished by having its calyx more deeply cleft anteriorly, he considering it as transitional to his section *Hemichroma* in which the inequality of the calyx-splitting is still further emphasized by the upper lobes becoming nearly or wholly united. (I take it that this character was drawn from the other specimen cited, a collection by Douglas that must have been *C. franciscana*.) It was natural that Gray in his "Synoptical Flora of North America" (2, pt. 1: 296, 1878) should have applied *C. affinis* to the plant that I am now calling *C. franciscana*, a course that has been consistently followed since.

DICRANOSTEGIA (Gray)

In order to define *Cordylanthus* Nutt. satisfactorily, I think that it is necessary to raise its section *Dicranostegia* Gray (in Proc. Amer. Acad. Arts & Sci., 19: 95, 1883) to generic rank. The latter has a calyx composed of two linear-attenuate lateral lobes (each actually comprising two wholly united petals) which are joined near the base and surround the corolla laterally and dorsally. The calyx is so small as to only equal the corolla-tube, whereas in *Cordylanthus* it is longer. But its peculiarity in *Cordylanthus* is the complete union dorsally of a calyx that had been bifid as in *Dicranostegia*, and then its elongation wholly on the upper side of the flower. It may wholly embrace the base of the corolla or only its dorsal half. Since

¹⁰ In De Candolle, Prod. Syst. Nat. Regn. Veg., 10: 532, 1846.

this seems to be the only satisfactory character of *Cordylanthus*, and its value as a criterion would be lost by the inclusion of *Dicranostegia*, I think the latter should be considered as a separate genus.

This is with the recognition that *Dicranostegia* demonstrates the bifid nature of the calyx that was common to its ancestry and that of *Cordylanthus*. The unequally placed anther-cells show that both genera are closely related to *Orthocarpus* and *Castilleja*, a relationship fully confirmed by the calyx. In all these genera, as in various other Euphrasieae, the uppermost calyx-lobe is lost and those of each side tend to unite laterally. Let the lateral union become complete, as in *Pedicularis racemosa* and *Castilleja coccinea*, and we have the calyx of *Dicranostegia*. The evolutionary stages, from an equally pentamerous to a seemingly, though falsely, 2-lobed state, are evident in various species of *Pedicularis*; and the last stage, to a seemingly 1-lobed state, curiously oriented to the upper side of the corolla, is reached in *Cordylanthus*.¹¹

Another distinction between *Dicranostegia* and *Cordylanthus* is in the season of flowering. In northern Baja California the former blooms from April to July, but throughout its wide range *Cordylanthus* is a plant of mid to late summer. It is remarkable that the species of this annual genus, usually occurring among sagebrush, wait for full growth and anthesis until the scorching days of summer.

Dicranostegia has only the single species, *D. orcuttiana* (*Cordylanthus orcuttianus* Gray in Proc. Amer. Acad. Arts & Sci., 19: 95, 1883) of northern Baja California. The type was collected by H. C. Orcutt and his son from "about 70 miles below the U. S. boundary", but C. R. Orcutt later found it near Tijuana just over the border. In company with Dr. Carl Epling I gathered it on April 23, 1940 slightly south of town on the road toward Ensenada. Being so near the border, it seems likely that it will sometime be found in San Diego County, California. Hence its inclusion in the present paper.

This handsome white-flowered species with its finely dissected foliage is in aspect very like a *Cordylanthus*.

CORDYLANTHUS Nuttall

Within the limits of *Cordylanthus* there is much differentiation that has evolutionary significance. Section *Hemistegia* is definitely more primitive than *Eucordylanthus*, the latter having its inflorescences reduced and head-

¹¹ The correct explanation of the calyx of *Cordylanthus* (*Adenostegia*) was first made by C. V. Morton in his study of *A. eremica* in Journ. Washington Acad. Sci., 22: 160-166, 1932. As has been already stated in these Proceedings (90: 12-13, 1938), I had independently reached the same solution more than ten years earlier. Previous workers had interpreted the calyx-like flowering bract of many species of *Cordylanthus* as being an actual portion of the calyx.

like with its flowering bracts slightly to mostly much modified and calyx-like, and its leaves much more finely cut. Within each section are species with four stamens, and those with stamens reduced to two. In a few species of *Eucordylanthus* there is a further trend to anthers retaining but one of the two cells.

The two sections may be distinguished by the following contrast.

- A. Leaves lanceolate to oblong, at least the lower entire; inflorescence an elongated spike, the bracts uniform, entire to pinnately lobed, nearly equaling to exceeding the corollas; calyx ample and spathe-like, enclosing proximal portion of corolla; plants halophytic.I. *Hemistegia*
- AA. Leaves or leaf-segments linear to filiform; inflorescence of head-like clusters (abbreviated spikes) of one to many flowers, the immediate flowering bracts usually modified and calyx-like; calyx itself narrow, enclosing the corolla (partially or wholly) only at base; plants not halophytic.II. *Eucordylanthus*

In the Pacific states the following species of *Cordylanthus* appear to have been hitherto undescribed.

I. *Hemistegia* Gray

This section of *Cordylanthus* was described as a new genus, *Chloropyron*, with a single species, *C. palustre*, by Behr in the Proceedings of the California Academy of Sciences (1: 61) in 1855, this name being actually a synonym of *Cordylanthus maritimus* Nutt., published in 1846. As a section, with three species that all remain in it, the group was named *Hemistegia* by Gray in the Proceedings of the American Academy of Arts and Sciences (7: 383) in 1867. The section now comprises six species of the western United States, of which two are now proposed as new to science.

These are both from the San Joaquin valley of central California, and pertain to a small group of species with corolla purplish, the stamens only two, and the bracts seemingly palmately deeply lobed. The species of this little group, all from the Interior Valley of California, may be distinguished as follows:

- A. Calyx bidentate at apex; galea dorsally with reflexed hairs; bracts with shorter hairs or even glabrescent; axillary fascicles not developed.
 - B. Bracts with spreading lobes, purple (at least distally), ciliate and on veins beneath somewhat pubescent, some of the hairs gland-bearing; corolla-lobes longer than the throat.C. *palmatus*
 - BB. Bracts with more ascending lobes, pubescent over entire surface to ciliate so or glabrescent, the hairs not glandular; corolla-lobes with more conspicuous membranous margins and about as long as throat.C. *carnosus*
- AA. Calyx entire at apex; galea dorsally with spreading hairs; bracts and leaves hirsute-hispid, the former with spreading lobes; axillary fascicles much developed.
 - C. *hispidus*

1. *Cordylanthus carnosus* sp. nov.

Plant 1.5-2 dm. tall, lax and somewhat decumbent, much branched, the stems hirsute-pubescent, and the remaining herbage pubescent with spreading glandless hairs to glabrescent. Leaves and bracts yellowish green, the

lower leaves oblong or oblong-lanceolate, smaller than the upper which have distally 1 or 2 pairs of lobes; bracts usually with 2 or 3 pairs of divaricately ascending lobes. Calyx 14-15 mm. long, oblong-lanceolate, concave and enclosing the proximal portion of the corolla, distally with acute teeth 1 mm. long. Corolla 15 mm long: its galea concave-rounded, minutely pubescent with reflexed hairs dorsally, with wide glabrous membranous margins; its lower lip with pubescent moderately inflated pouch and very minute glabrous lobes. Stamens two (only the lower pair present). Capsule 6-7 mm. long.

Caulis 1.5-2 dm. altus, laxis, ramosissimus, hirsuto-pubescent; folia oblonga vel oblongo-lanceolata, integra, pubescentia glabrescentiave, superiora majora et lobata; bracteae 4-6-lobatae; calyx 14-15 mm. longus, oblongo-lanceolatus, concavus, apice bidentatus; corolla 15 mm. longa, galea dorso minute pubescente, labio inferiore pubescente saccato lobis minutis glabris; stamina duo; capsula 6-7 mm. longa.

Type, six miles south of Kerman, Fresno County, California, collected in flower and fruit July 29, 1937 by R. F. Hoover, no. 2636; in Dudley Herbarium of Stanford University, isotype at Academy of Natural Sciences of Philadelphia.

2. *Cordylanthus hispidus* sp. nov.

Plant 1.5-2 dm. tall, erect or diffuse, much branched throughout, including small leafy shoots fasciculate in axils of stem-leaves, the herbage hirsute-hispid with spreading glandless hairs. Leaves and bracts pale green, the former oblong and entire, the latter lance-ovate, with 3 pairs of ascending-spreading lobes. Calyx 14 mm. long, lanceolate, concave and enclosing the proximal portion of the corolla, entire to the obtuse apex. Corolla 15 mm. long: its galea concave-rounded, finely pubescent with spreading hairs dorsally, with wide glabrous membranous margins; its lower lip with pubescent moderately inflated pouch and very minute glabrous lobes. Stamens two (only the lower pair present). Capsule not seen.

Caulis 1.5-2 dm. altus, erectus diffususve, ramosissimus, hirsuto-hispidus non glandulosus; folia oblonga, integra; bracteae lanceolato-ovatae sexlobatae; calyx 14 mm. longus, lanceolatus, concavus, integer, obtusus; corolla 15 mm. longus, galea dorso pubescente, labio inferiore pubescente saccato lobis minutis glabris; stamina duo; capsula non visa.

Type, Volta, Merced County, California, collected in flower July 14, 1937 by R. F. Hoover, no. 2605; in Dudley Herbarium of Stanford University, isotype at Academy of Natural Sciences of Philadelphia.

II. *Eucordylanthus*

By Asa Gray (in Proc. Amer. Acad. Arts & Sci., 7: 381, 1867) the typical section of *Cordylanthus* was called *Adenostegia*, this having been the generic name suggested by Bentham and published by Lindley in the second edition of his "Natural System of Botany" (p. 445) in 1836. Since *Cordylanthus* Nuttall dates only from Bentham's adoption of it, in place of his own *Adenostegia*, in DeCandolle's "Prodromus Systematis Naturalis Regni Vegeta-

bilis" (10: 597) in 1846, it is clear that *Adenostegia* has ten years' priority. But *Cordylanthus* has been made a nomen conservandum, a course that supplies us a more fitting name for these remarkable flowers; the corollas are all rather club-shaped as that name signifies, but only some of the species possess a covering of glandular hairs and so would deserve the name of *Adenostegia*. This name would be inappropriate even as used by Gray, and fortunately need not be adopted since the portion of a genus containing its typical species is better designated by the prefix "Eu".

In the Pacific states there are at least 23 species of *Eucordylanthus*, while there are others over the plateaus eastward to Wyoming and New Mexico. These are annuals with wonderful ability to reach maturity in arid sagebrush land in the hottest time of summer. In such environments annual plants are usually restricted to spring or a short period after rains. It is partly as a result of their time of blooming that so many species have been hitherto overlooked.

3. *Cordylanthus ramosus setosus* subsp. nov.

Plants stiffly branched, 1-2 dm. tall; heads 5-10-flowered, the outer bracts with plane linear lobes, these and the flowering bracts strongly setose; corolla apparently brighter yellow, its yellow throat more strongly purple-spotted.

Caulis 1-2 dm. altus, rigide ramosus; capitula 5-10 florum, lobis bractearum exteriorum planis linearibus setosis, bractea florescente setosa; corolla ut videtur flavior.

Type, among stunted *Artemisia* (sagebrush) at 9350 feet altitude, east of Swamp Meadow, Sweetwater Mountains, Mono County, California, collected in flower August 9, 1945 by Annie M. Alexander and Louise Kellogg, no. 4564; in herbarium of Academy of Natural Sciences of Philadelphia.

In *Cordylanthus ramosus typicus* (*C. ramosus* Nutt.), the plants are mostly 2-3 dm. tall and slenderly much branched; the heads are 3-5-flowered, and both the outer and flowering bracts are greyish-puberulent like the remaining herbage; and the corolla is brownish yellow. *C. ramosus typicus* occurs in sagebrush land from central Oregon and northeastern California to Wyoming and Colorado, but *C. r. setosus* is more southern, in mid-eastern California and western Wyoming, wholly in the Great Basin. Perhaps the latter is specifically distinct.

4. *Cordylanthus ferrisianus* sp. nov.

Plants 4-6 dm. tall, diffusely much branched, the stem and leaves finely pubescent with recurving glandless hairs, the bracts glabrescent on surfaces but more or less ciliate on margins. Leaves linear, with a pair of linear lobes, the segments obtuse or acutish. Inflorescence a short head-like cluster of 3 to 5 flowers, subtended by several 3-lobed outer bracts (the lobes lanceolate or oblong). Flowering bracts 13-15 mm. long, lance-oblong, rounded

at apex, distally green and setose-pilose. Calyx 14-16 mm. long, lanceolate, distally entire. Corolla 13-16 mm. long, white (not seen fresh): its galea dorsally minutely pubescent, glabrous at apex, with wide white membranous margins; its lower lip slightly shorter, with horizontally widened, moderately inflated, sparsely (laterally) pubescent pouch and with apex seemingly unlobed. Stamens four, the anthers alike and the filaments all bearded. Capsule 9-10 mm. long.

Caulis 4-6 dm. altus, diffuse ramosissimus, pubescens; folia linearia, trilobata, pubescentia, lobis obtusis acutiusculisve; capitula 3-5 florum; bracteae glabrescentes ciliatae, exterioribus pluribus trilobis, florescentibus singulis lanceolato-oblongis rotundatis setoso-pilosis; calyx 14-16 mm. longus, lanceolatus, integer; corolla 13-16 mm. longa alba, galea dorso minute pubescente apice glabra, labio inferiore paulum brevius transverse ampliatus apice ut videtur non lobatus; stamina quatuor; capsula 9-10 mm. longa.

Type, on dry slope among pines, at 7000 feet altitude, in upper Paradise Valley, near junction of Woods Creek and South Fork of the Kings River, Kings Canyon National Park, Fresno County, California, collected in flower August 31, 1941 by Annie M. Alexander and Louise Kellogg, no. 2612; in Herbarium of Academy of Natural Sciences of Philadelphia.

It gives me especial pleasure to name this species for Roxana Stinchfield Ferris, who in 1918 (in Bull. Torrey Bot. Club, 45: 399-423, pls. 10-12) under the caption "Taxonomy and Distribution of *Adenostegia*" has published our most recent and most comprehensive revision of this genus. Mrs. Ferris has long assisted Professor Abrams in the care of the Dudley Herbarium at Stanford University.

This species of the open coniferous forests of the southern Sierra Nevada appears to be nearest akin to *Cordylanthus littoralis* (Ferris) Macbr. of the Monterey Peninsula and *C. platycephalus* of Santa Barbara, the three contrasting with *C. rigidus* (Benth.) Jepson and its close allies in the outer bracts (with their lobes) being not or scarcely widened distally, the heads less densely crowded and not or only softly setose-ciliate, and the plants relatively widely branched. The three species may be distinguished as follows:

- A. Corolla 13-16 mm. long, its lower lip externally only sparsely pubescent, the flowers 3 to 5 in a cluster; plants finely pubescent, or the bracts glabrescent but ciliate.
C. ferrisianus
- AA. Corolla 17-21 mm. long, its lower lip externally pubescent; plants softly pubescent throughout.
 - B. Plants 3-6 dm. tall, diffusely and very widely branched; flowers 4 to 6 in a cluster, each corolla 20-21 mm. long; bracts finely pubescent, but nearly eciliate. *C. littoralis*
 - BB. Plants 4-12 dm. tall, with many ascending-spreading branches; flowers 5 to 10 in a cluster, each corolla 17-20 mm. long; bracts setosely ciliate and pilose.
C. platycephalus

5. *Cordylanthus platycephalus* sp. nov.

Plants 4-12 dm. tall, with many ascending-spreading branches, not glandular, the herbage pubescent and with many interspersed longer hairs, and the bracts setose-ciliate or -pilose. Leaves linear or lance-linear, with a pair of divaricate linear lobes, the segments acutish or narrowly obtuse. Inflorescence a short head-like spike of mostly 5 to 10 flowers, subtended by several 3-lobed outer bracts (the segments lanceolate or oblong-lanceolate and not widening distally). Flowering bracts 17-21 mm. long, lance-oblong, acute, yellowish green, setose-pilose and finely ciliate. Calyx 17-21 mm. long, lanceolate, distally entire or nearly so. Corolla 17-20 mm. long, white: its throat with 2 dark violet antero-lateral lines; its galea dorsally minutely pubescent, wax-yellow and glabrescent at apex, with wide white membranous margins; its lower lip horizontally widened and moderately inflated, the pouch laterally finely pubescent and with narrow black margins (as seen from above), internally glabrous, and with its apex seemingly unlobed (actually slightly lobed, but each lobe with everted margin). Stamens four, the anthers alike and the filaments all bearded. Capsule not seen.

Caulis 4-12 dm. altus, ramosissimus, pubescens; folia linearia vel lanceolato-linearia, trilobata, segmentis acutiusculis vel obtusiusculis, pubescentia; capitula 5-10 florum; bracteae setoso-ciliatae vel -pilosae, exterioribus pluribus trilobis, florescentibus singulis lanceolato-oblongis acutis setoso-pilosis ciliolatis; calyx 17-21 mm. longus, lanceolatus, integer vel subinteger; corolla 17-20 mm. longa alba, galea dorso minute pubescente apice flavâ et glabrescente, labio inferiore transverse ampliato intus glabro apice ut videtur non vel sublobato; stamina quatuor; capsula non visa.

Type, loam soil in grove, at 500 to 600 feet altitude, Montecito, Santa Barbara County, California, collected in flower August 22, 1940 by Francis W. Pennell, no. 26463; in herbarium of Academy of Natural Sciences of Philadelphia. This was collected in company with Donald C. Peattie in the former garden of the estate on which he and Mrs. Peattie were then residing.

6. *Cordylanthus compactus* sp. nov.

Plant 7-10 dm. tall, with stiffly ascending branches, the lower shorter and foliose, the upper longer, less leafy and terminating in inflorescences. Herbage not glandular, finely pubescent, the stem and lower leaves with some longer interspersed hairs, the bracts and calyces coarsely setose-pilose. Leaves and leaf-segments linear and obtuse, somewhat involute, leaves of the main stem with a pair of linear lobes but those of the branches entire. Inflorescence a short compact head-like spike, of 5-15 flowers, subtended by several 3-lobed outer bracts (the segments linear-oblong to mostly -oblanceolate). Flowering bracts 13-15 mm. long, oblong, rounded or mucronulate, pale yellowish green and distally dull olive-brown, setose-pilose and ciliate. Calyx 13-15 mm. long, oblong- to narrowly lanceolate, acute. Corolla 12-13 mm. long, light chalcedony-yellow: its throat with maroon lines below (but not reaching) all the sinuses; its galea dorsally finely pubescent, distally chalcedony-yellow, the apex slightly hooded by the wide white membranous margins; its lower lip slightly wider, little inflated, the pouch chal-

cedony-yellow and glabrescent, proximally dark brown but mostly pale yellow (light chalcedony yellow), distally with incurved chalcedony-yellow margins but without evident lobes. Stamens four, the anthers alike and the filaments all bearded. Capsule 8-9 mm. long.

Caulis 7-10 dm. altus, ramis rigide adscendentibus, omnino pubescens; folia linearia, obtusa, trilobata sed in ramis integra, pubescentia; capitula compacta 5-15 florum; bracteae et calyces setoso-pilosae, bracteis exterioribus pluribus segmentibus lineari-oblongis -oblanceolatisve trilobatis, bracteis florentibus singulis oblongis rotundatis mucronulatisve; calyx 13-15 mm. longus, lanceolatus, acutus; corolla 12-13 mm. longa, viridescens-flava, fauce lineis atrorubris instructa, galea dorso pubescente, labio inferiore paulum inflato intus glabro apice ut videtur integro; stamina quatuor; capsula 8-9 mm. longa.

Type, sandy soil over granite, at 5400 feet altitude, 14 miles south of Yosemite Valley on road to Auberry, in Mariposa County, California, collected in flower August 2, 1940, by Francis W. Pennell, no. 26384; in herbarium of Academy of Natural Sciences of Philadelphia.

Sandy or gravelly granitic soil, western slope of the southern Sierra Nevada from Mariposa to Tulare counties, California.

The type in the Gray Herbarium of Harvard University shows that this species was that primarily intended by Asa Gray in proposing *Cordylanthus filifolius brevibracteatus* (in Bot. Calif. 1: 622, 1876), a name which has fortunately not been given specific status. Gray's description was brief, and his emphasis upon the shortness of the bracts unfortunate, so that I am glad that the Rules of Botanical Nomenclature permit us to pass by his name in favor of one really fitting. The tightness of the flower-clusters makes that chosen most apt.

Cordylanthus compactus accords with *C. rigidus* (Benth.) Jeps. of the coastal mountains of central California and *C. filifolius* Nutt. of southern California in the bracts of the head-like inflorescence being rather harshly setose-pilose, the outer bracts widened distally, and the branches of the plant ascending rather than widely spreading. These three species may be distinguished as follows:

- A. Throat of corolla longer than wide, hardly distinguishable from tube; outer bracts with linear-oblanceolate plane bodies, their width little (less than twice) or not exceeded by the length of the spreading setae, the bracts green to apex; corolla 12-14 mm. long.
- B. Plant laxly branched, several or many of the lateral branches exceeding the central stem; outer bracts setose-hairy as well as ciliate, less obviously widened distally; flowers 3 to 6 in a loose head, the corolla presumably dull yellowish.
C. rigidus
- BB. Plant more strictly branched, the lateral branches stricter and more erect, only the uppermost sometimes exceeding the central stem; outer bracts setose-ciliate, but slightly or not setose otherwise; flowers 5 to 15 in a compact head, the corolla light yellow, proximally dark brown within throat. ...*C. compactus*

AA. Throat of corolla wider than long, strongly contrasted with tube; outer bracts with filiform-oblancoelate bodies, their width much (at least twice) exceeded by the spreading setae, the bracts with blackish violet callose tips; corolla 14-16 mm. long, white, with dull purple wide antero-lateral lines. *C. filifolius*

7. *Cordylanthus pallescens* sp. nov.

Plant 3-6 dm. tall, with many ascending branches, finely pubescent with spreading hairs of which only some on the stem below the inflorescence are gland-tipped. Leaves numerous on lower part of plant, on the upper part small and remote, linear and tending to involute, obtuse. Inflorescence a 1- to 3-flowered cluster, subtended by several 3-lobed outer bracts, the segments flat and widened distally to rounded apices, the flowering bract and calyx light chalcidony yellow, distally chalcidony yellow, with dark vinaceous-purple tips. Flowering bract 13-17 mm. long, oblong, rounded or minutely 3-toothed at apex. Calyx 14-18 mm. long, narrowly lanceolate, slightly bifid with purple-brown tips. Corolla 12-13 mm. long; its throat laterally garnet-brown, dorsally paler, ventrally yellowish white; its galea white, minutely pubescent dorsally, the rounded hardened yellowish apex fitting into concavity of lower lip, the lateral membranous margins white; its lower lip horizontally widened and hollowed so as to embrace much of galea, externally pubescent, internally glabrous, the margins of the shallow lobes incurved. Stamens four, the anthers alike and the filaments all bearded. Capsule 7 mm. long.

Caulis 3-6 dm. altus, ramis adscendentibus, pubescens, pilis solum sub inflorescentiâ glandiferis; folia inferne congesta sed superne pauca et remota, omnia linearia et obtusa; capitula 1-3 florum; bracteae et calyces pallide viridescenti-flavae, bracteis exterioribus pluribus segmentibus planis et distaliter ampliatis trilobatis, bracteis florescentibus singulis oblongis rotundatis vel 3-dentatis apice atropurpureis; calyx 14-18 mm. longus, anguste lanceolatus, apicibus atropurpureis bifidus; corolla 12-13 mm. longa, fauce latere brunneâ dorso pallidiore ventro ochroleucâ, galeâ albâ dorso minute pubescente apice flavescente induratâ, labio inferiore transverse inflato extus pubescente intus glabro apice sublobato; stamina quatuor; capsula 7 mm. longa.

Type, gravelly andesitic soil, at 3800 feet altitude, on route 99, 2 to 3 miles north of Mount Shasta City, Siskiyou County, California, collected in flower July 18-19, 1940 by Francis W. Pennell, no. 26184; in herbarium of Academy of Natural Sciences of Philadelphia.

Apparently peculiar to a small area west of Mount Shasta, northern California.

Cordylanthus pallescens is most nearly related to *C. hanseni* (Ferris) Macbride of the northern Sierra Nevada (north to Shasta County) and *C. viscidus* (Howell) Pennell of the Klamath Mountains of southwestern Oregon and northwestern California, the three species agreeing in their three-lobed outer bracts the segments of which bear enlarged tips. They seem to differ as follows:

- A. Flower-clusters brownish or purplish, hirsute; corolla with relatively dark galea; plants plentifully glandular.
- B. Lobes of outer bracts linear, flat, often relatively distally placed; corolla 15-18 mm. long. *C. hansenii*
- BB. Lobes of outer bracts narrowly linear or filiform, often involute, more proximally placed; corolla 13-16 mm. long. *C. viscidus*
- AA. Flower-clusters light yellow-green, finely pubescent (the bracts ciliate); corolla with galea white; plant finely pubescent, the hairs on stem beneath inflorescence gland-tipped, but elsewhere glabrous. *C. pallescens*

8. *Cordylanthus diffusus* sp. nov.

Plants 4-8 dm. tall, with many widely ascending-spreading slender branches, canescent-pubescent with fine hairs, the stems with fine gland-bearing hairs below the inflorescences or else the plants glabrous throughout. Leaves linear or nearly linear, entire, obtuse. Inflorescence a cluster of 1 to 3 flowers, subtended by a few outer bracts which are enlarged and usually eccentrically angled at apex, the flowering bract and calyx ciliate-pubescent. Flowering bract 14-15 mm. long, brownish but with 5 green ribs, lance-oblong, obtuse or rounded. Calyx 15-16 mm. long, green, 5-ribbed, narrowly lanceolate, distally bidentate. Corolla 13-14 mm. long, yellowish: its throat horizontally widened, white; its galea dorsally glabrescent, pale yellow with vinaceous flecking proximally, with glabrous decurved beak and with pale membranous margins; its lower lip slightly pouched, externally minutely pubescent distally and laterally, internally glabrous, the margins of the shallow lobes incurved. Stamens four, the anthers nearly alike and the filaments all bearded. Capsule 7 mm. long.

Caulis 4-8 dm. altus, ramosissimus, canescenti-pubescent, pilis sub inflorescentia glandiferis vel totis eglandulosis; folia linearia superne pauca et remota, pubescentia; capitula 1-3 florum; bracteae surdae, exterioribus paucis plerumque apice irregulariter ampliatis vel angulatis, florentibus singulis lanceolato-oblongis, brunneis, obtusis rotundatisve; calyx 15-16 mm. longus, viridis, anguste lanceolatus, bidentatus; corolla 13-14 mm. longa, flavescent, fauce transverse ampliata albâ, galeâ dorso glabrescente ochroleucâ apice glabrâ, labio inferiore paulum saccato extus minute pubescente intus glabro apice incurvo sublobato; stamina quatuor; capsula 7 mm. longa.

Type, stony serpentine soil, at 1600 to 1800 feet altitude, on route 29, 7 miles south of Middletown, Lake County, California, collected in early anthesis July 4, 1940 by Francis W. Pennell, no. 26051; in herbarium of Academy of Natural Sciences of Philadelphia.

In the Coast Ranges of northwestern California, seen from Trinity to Lake counties.

Cordylanthus diffusus is nearest related to *C. pilosus* Gray of the vicinity of San Francisco Bay and *C. bolanderi* (based on *C. pilosus bolanderi* Gray in Proc. Amer. Acad. Arts & Sci., 7: 382, 1868) of the southern Cascade Range and Sierra Nevada (from Klamath County, Oregon to Mariposa County, California), the three species agreeing in entire or merely angulately lobed outer bracts, hirsute inflorescence, and flat linear leaves. They seem to differ as follows:

- A. Tips of outer bracts enlarged, usually angulate (to rudimentary bases of one or both lateral lobes).
 - B. Plant hirsute with slender glandless hairs that much exceed the short gland-tipped ones; main cauline leaves widely linear; branches strongly ascending.
 - C. pilosus*
 - BB. Plant canescent-pubescent with fine glandless hairs, but with gland-bearing hairs on stems below inflorescences; main cauline leaves linear or narrowly so; branches widely ascending-spreading, diffuse. *C. diffusus*
- AA. Tips of outer bracts not or scarcely enlarged, not angulate though often callose; plant pubescent, glandularly so above or throughout. *C. bolanderi*

9. *Cordylanthus brunneus* (Jepson) status novus

Based on *Cordylanthus pilosus brunneus* Jepson (Man. Fl. Pl. Calif., 946, 1925) from Mt. St. Helena, this is a species peculiar to the Inner Coast Ranges in Sonoma and Napa counties, north of San Francisco Bay, California. This and *C. tenuis* Gray, of the eastern slope of the Sierra Nevada in California and on adjacent mountains of Nevada, differ from *C. pilosus* and its nearest relatives in having the inflorescence merely pubescent, with bracts finely ciliate, the leaves narrowly linear or filiform and mostly involute, and the stem bifariously minutely pubescent or else quite glabrous. The two differ as follows:

- A. Tips of outer bracts enlarged, often essentially angulate-lobed; corolla pale or white, with conspicuous dark maroon-purple streaks; plants diffusely branched, the flowers solitary. *C. brunneus*
- AA. Tips of outer bracts not or scarcely enlarged, not angulate nor strongly callose; corolla chalcedony-yellow, its galea wholly brown and the throat laterally purple-brown, but with less conspicuous or no dark lines; plant with many ascending branches, the flowers in clusters of 1 to 3. *C. tenuis*

REVISION OF THE MEXICAN MELANOPLINI
(ORTHOPTERA: ACRIDIDAE: CYRTACANTHACRIDINAE)
PART I

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This paper represents the first portion of a taxonomic study of members of the Tribe Melanoplini centering in Mexico. This and forthcoming parts will treat some 34 genera. The present paper includes 10 genera, and 25 species and subspecies, of which 1 genus, 4 species, and 2 subspecies are new. The genera treated here are as follows:

<i>Netrosoma</i>	<i>Dasyscirtus</i>
<i>Trigonophymus</i>	<i>Aztecacris</i>
<i>Aidemona</i>	<i>Poecilotettix</i>
<i>Dactylotum</i>	<i>Hesperotettix</i>
<i>Perixerus</i>	<i>Philocleon</i>

The author spent four summers in Mexico (1935, '36, '38, and '40) collecting some 10,000 to 12,000 Orthoptera. The major portion of these belong to the family Acrididae, and perhaps the most interesting of them are the Melanoplini. They show remarkable geographical differentiation. Though not evident from this paper, at least 40% of the species or subspecies prove to be new, and many changes in generic position have become necessary.

Problem

The Melanoplini from Mexico comprise a very important and cohesive element of the North American members of the tribe. Seudder (1897a) and Hebard (1917) in their studies of this group from Mexico had a very meager amount of material for study, so that it was often very difficult to see the interrelationships of the species before them. Now with many additional new species and specimens it becomes possible to associate the species with much greater certainty, especially those within any one genus.

The value of the generic category is a puzzling problem in a group such as this, where a great amount of evolutionary radiation has occurred. There is the usual large genus (*Melanoplus*) containing more than 150 species. Then there are a number of closely related peripheral groups of species

recognized as genera (such as *Paroxya* and *Eotettix*). Finally there are more distantly related clusters of species groups where it is difficult to know whether to treat each cluster as a single genus or a group of several genera. This has been one of the major problems among the Mexican Melanoplini. At first larger more inclusive genera were attempted, but soon a few very large genera resulted which were even more difficult to define, and a change to the opposite approach was necessary. The subgeneric category has not been generally used for the Melanoplini, but its use will undoubtedly help solve this problem. However, it was decided to avoid its use for the present until a more comprehensive survey of the North American Melanoplini can be made.

Explanation of Treatment

For those authors who are frequently cited with the date and page only, refer to Selected Bibliography at end of paper. All recorded specimens from Mexico that do not have a collector indicated in parenthesis were secured by the author, and are in this Academy's collections.

Acknowledgments

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Tribe MELANOPLINI

This large association of genera of the Cyrtacanthacridinae has been generally referred to as the Group Melanopli and the Old World representatives of the association as the Group Podismae. At times both names have been used with the -ini termination which is the usual termination for the category of tribe. Since the term group is rather informally used for associations of either species or genera, and since the Melanoplini is a large and well-recognized "group" of genera the category of tribe seems justified.

NETROSOMA Scudder

Netrosoma Scudder, 1897a, p. 195 (no included species). Type: *N. fusiiformis* Scudder [= *N. fusiiforme*] by subsequent designation, Scudder, 1897b, p. 17.

The unusual color pattern and form of the head of the members of this genus make it a very divergent element of the Melanoplini. The four species of the genus have certain common features that indicate a close rela-

tionship, but at the same time they have become highly differentiated, as for example, the striking sexual dimorphism in *N. xanthops* and the absence of tegmina and auditory tympana in *N. nigropleura*. Members of the genus have been found from Texas to Puebla and Guerrero.

Diagnosis.—Fastigium strongly produced cephalad and face in profile retreating to a degree unusual for the Melanoplinae. Pronotal disk with caudal margin concave and lateral margins of the male smoothly rounded into lateral lobes. Tegmina absent or little more than covering auditory tympana. Cerci of male simple, rather heavy with apex more or less acute and bent or directed caudad: (figs. 2-5). Furculae absent or very weakly developed and widely spaced apart. Subgenital plate of male small, simple with dorsal margin incurving smoothly to merge with pallium. Darker areas of color pattern usually a mahogany brown, pale areas yellowish white to pale buffy brown.

Key to the Species of *Netrosoma*

1. Apterous and tympana absent *N. nigropleura*
Brachypterous and tympana present 2
2. Genicular lobes of hind femora light in color, usually suffused with red. A narrow, median, longitudinal, black stripe on dorsum of head *N. fusiforme*
Genicular lobes of hind femora fuscous or black. No median black stripe on dorsum of head 3
3. Median, longitudinal, yellowish stripe on pronotum not wider than the interocular area. Females have a similar color pattern to males and lack any defined lateral margins of the disk of the pronotum *N. rubricorne*
Median, longitudinal, yellowish stripe of the pronotum wider than the interocular area in the males. Females have defined lateral margins of the disk of the pronotum *N. xanthops*

Netrosoma nigropleura Scudder

Text-fig. 2.

Netrosoma nigropleura Scudder, 1897b, p. 18 (type locality: Lerdo, Durango, Mex.). Bruner, 1908, p. 300. Hebard, 1917, p. 252.

Specimens.—COAHUILA: 20-26 miles west of Saltillo, 4000 ft., IX, 14, 1936, 2 ♂, 3 ♀.

Found in extreme desert country. The small size and apterous condition of the species suggest the rigorous conditions of the environment. The species is also recorded from localities in the Big Bend region of Texas.

Netrosoma fusiforme Scudder

Text-fig. 3.

Netrosoma fusiforme Scudder, 1897b, p. 17 (type locality: Monclova, Coahuila, Mex. [not Montelovez, Chihuahua]). Hebard, 1917, p. 252.

Specimens.—NUEVO LEON: Mamulique Pass, 1800 ft., VII, 10-11, 1936, 7 ♂, 7 ♀, 3 juv.; same locality, IX, 17, 1936, 2 ♂, 1 ♀; 15 miles west of Monterrey, 3000 ft., IX, 15, 1936, 1 ♂; Galeana, 5000 ft., VII, 13, 1938, 1 ♂, 2 ♀. COAHUILA: Higueros, between Monterrey and Saltillo, 4000 ft., IX, 13-14, 1936, 2 ♂, 2 ♀; 6 miles west of Saltillo, 5000 ft., VII, 15, 1936, 1 juv.

The vegetation of the above localities is definitely xerophytic, but far more luxuriant than where the preceding species was secured, and this difference of environment is reflected in the much larger size and brilliant coloration of the species.

Netrosoma rubricorne¹ new species

Text-fig. 5; plate 6, figs. 19-21.

Diagnosis.—Besides features in key, the cercus of male is more slender than in other species, distal width about half width of base, not plate-like. Tegmina brachypterous, apex acute and reaching the 4th tergum or nearly so. Besides the yellowish, median longitudinal stripe on dorsum of head, there are narrow stripes on either side of the median one which extend back from the eyes.

Type.—♂; km. 226 (from Mexico City) northwest of Tehuacan, Puebla, Mexico. Elevation 6500 ft. August 23, 1936. (H. R. Roberts.) [Acad. Nat. Sci. Phila., Type no. 5572.]

Description.—Antennae relatively long, longer than hind femora, filiform, not especially heavy. Fastigium greatly produced with a median longitudinal impression; greatest width just anterior to lateral ocelli; from lateral aspect it extends in a straight line, slightly declivent to the apex where it rounds sharply into the frontal costa. Face strongly retreating with profile of frontal costa forming about 30° with vertical line. Frontal costa broadly impressed both above and below the median ocellus. Lateral facial carinae present and the carinae which extend from below the eyes unusually prominent. Pronotum lacks any distinct lateral carinae, the disk rounding smoothly into the lateral lobes; only a slight suggestion of a median longitudinal carina; transverse sulci not pronounced; caudal margin broadly emarginate or concave; surface weakly impresso-punctate. Prosternal spine pyramidal with blunt apex. Tegminal length about three times the median width; margins feebly diverge from base to slightly beyond mid-point and from thence converge to an acute apex; one pronounced, median, percurrent vein, others weaker not usually percurrent. Subgenital plate not at all swollen and relatively small; dorsal margin poorly defined, merging with pallium. Supra-anal plate tongue-shaped, proximal width about equal to length. Furculae absent or but faintly suggested. Cerci slender, not broadly lamellate and not extending beyond supra-anal plate; lateral margins taper gradually from the base to the acute apex which is directed slightly caudad (fig. 5).

Female.—Similar in color and general structure to the male, but considerably larger. Fastigium less produced and face much less retreating. Antennae shorter. Tegmina more reduced, only extending to middle of second abdominal tergum; apices much less acute.

Coloration.—The general pattern may be seen from plate 6, figs. 19-21. The darker areas are black or dark reddish brown. The pale areas are dull cream color varying with a reddish or yellowish suffusion. Antennae orange red, becoming dark apically. Ventral and inner proximal face of hind femora orange red. Hind tibiae dull blue.

¹ An allusion to the orange red antennae.

Measurements.—(Type and ♀ topotype) length of body ♂ 15, ♀ 23; length of antennae ♂ 12, ♀ 9.8; length of pronotum ♂ 4, ♀ 4.5; length of tegmina ♂ 4.2, ♀ 4.4; length of hind femora ♂ 11, ♀ 13.3 mm.

Specimens.—PUEBLA: in addition to the type there are 28 ♂, 9 ♀, and 3 juv. with the same data; same locality, VIII, 16, 1938, 3 ♂, 1 ♀. GUERRERO: Mexcala, Rio Balsas, 1000 ft., IX, 13, 1940, 5 ♂, 2 ♀, 4 juv. (C. Bolívar & H. R. Roberts).

Discussion.—This species more nearly resembles *N. fusiforme* in its xerophytic habitat and in lacking the marked sexual dimorphism of *N. xanthops*. In geographical distribution, however, it is closer to this latter species. The specimens from the Rio Balsas are very much larger in size (length of body: ♂ 21-23; ♀ 22-24 mm.), but in other respects, including the male terminalia, there is nothing to distinguish them.

*Netrosoma xanthops*² new species

Text-fig. 4; plate 6, figs. 22-24.

Diagnosis.—Besides features in key, fastigium and dorsum of frontal costa more greatly produced; face more retreating than in other species. Pale stripe on dorsum of pronotum becomes markedly broader cephalad. Color pattern and general form strikingly different in the two sexes.

Type.—♂; km. 196 (from Mexico City) between Zimapan and Ixmiquilpan, Hidalgo, Mexico. Elevation 6,000 ft. September 9, 1936. (H. R. Roberts.) [Acad. Nat. Sci. Phila., Type no. 5573.]

Description.—Length of antennae shorter than hind femora, filiform, thicker distad. Face strongly retreating, forming an angle of about 45° with vertical line. Eyes more prominent than in other species. Lateral facial carinae well developed, and the carinae extending below the eyes very pronounced as in *N. rubricorne*. These carinae below the eyes are absent in *N. nigropleura* and *N. fusiforme*. Fastigium rounds smoothly into frontal costa without any suggestion of an angular break. Greatest width of fastigium nearly equal to the width of the frontal costa.

Disk of pronotum rounds smoothly into the lateral lobes; median carina of disk but faintly suggested; caudal margin broadly emarginate, more deeply so than in the other species. Prosternal spine pyramidal with blunt apex. Tegmina;³ brachypterous, reaching about middle of 2nd tergum; oval in shape with rounded apex, length about twice the width; venation weakly percurrent. Hind femora less robust than in the other species. Subgenital plate much as in other species. Supra-anal plate triangulate, proximal width equal to length, apex sharply pointed. Cerci most nearly similar to *N. fusiforme*; short and broad, length about twice the width; width equal from base to near apex where it tapers rapidly to a point directed caudad and slightly mesad (Fig. 4). Furculae, very small protuberances separated by a distance about equal to the width of cercus.

² An allusion to the yellow face.

³ For variation in this feature see "discussion" below.

Female.—General form and color pattern strikingly different from male. Size very much larger. Fastigium shorter and much broader; very slightly impressed; lateral margins expanding from interocular area to mid-point and from thence forming a bluntly rounded apex; in lateral aspect fastigium at apex rounds quite sharply into frontal costa. Face but slightly retreating and straight from lateral aspect. Frontal costa very slightly expanded, and impressed above median ocellus. Pronotum has decided angular break between the disk and the lateral lobes; the lateral margins of the disk are slightly concave and strongly diverge caudad from dorsal aspect and at the same time curve somewhat ventrad. Caudal margin of disk similar to male. Tegminal pads closely similar to male in size and shape, except they are broader proximad. However, they never develop the strongly attenuate form sometimes encountered in the male and discussed below.

Coloration.—Male with darker areas of head and pronotum dark reddish brown; lighter areas dull cream color, with face usually more yellowish. Ventral portions of the thorax and in some specimens also the abdomen and hind femora bright lemon yellow. If the colors are not well preserved, as in the case of the type, the yellow is usually lost. Distal segments of labial and maxillary palps in a few specimens bone white, probably always so in life. The outer face of the hind femora in material from the type locality dull olive brown with little or no suggestion of barring, but in some specimens from other localities there are two dark bars; genicular region fuscous black. A pale annulus is present distad on the hind femora and proximad on the hind tibiae; rest of hind tibiae blue to grayish blue.

Female lacks most of the striking color pattern of male and is decidedly variable. General color dull fuscous brown; whole disk of pronotum uniform in color and always paler than the adjacent portions of the lateral lobes. Some specimens have a broad, well defined, dark band on the dorsal portion of lateral lobes of pronotum and a light area ventrad, this pattern somewhat resembling that of the males. This light area or stripe becomes more or less obsolete in other specimens. Annuli of hind femora and tibiae are in most cases not as strongly marked as in the males. Distal portion of hind tibiae often reddish.

Measurements.—(Type and ♀ topotype). Length of body ♂ 16, ♀ 22; length of antennae ♂ 9, ♀ 8.8; length of pronotum ♂ 3.8, ♀ 5; length of tegmina ♂ 3, ♀ 3.5; length of hind femora ♂ 10, ♀ 12.5 mm. The male is somewhat larger and the female smaller than the average of the series before me.

Specimens.—Males with rounded apices of the tegmina are indicated by an R, those with acute, attenuate apices by an A, those intermediate in this respect by an I. HIDALGO: km. 312, above Chapulhuacan, 4-5000 ft., IX, 9, 1940, 1 ♂ A, 1 ♂ I, 2 ♀; 3-8 miles north of Jacala, 5-6000 ft., VII, 30, 1936, 7 ♂ A, 11 ♂ R, 16 ♀, 1 juv. ♀; same locality, IX, 10, 1940, 2 ♂ R; Maguey Verde, south of Jacala, 7500 ft., VII, 31, 1936, 2 ♀; km. 196 between Zimapan & Ixmiquilpan, 6000 ft., IX, 9, 1936, 5 ♂ R (including type), 1 ♂ I, 3 ♀, 6 juv.; Tula River, Tasquillo, 5500 ft., IX, 9, 1936, 1 ♀, 2 juv.; El Chico Park, 9000 ft., VIII, 7, 1938, 5 ♂ R, 3 ♀, 2 juv.; Zacualtipan,

6500 ft., VIII, 9, 1938, 2 ♂ I, 3 ♂ R, 6 ♀; Tianguistengo, 5500 ft., VIII, 13, 1938, 2 ♂ R. MICHOACAN: Morelia, 6-8000 ft., IX, 4-5, 1938, 3 ♂ I, 2 ♂ R, 1 ♀.

Discussion.—Striking variation is apparent among the specimens taken near Jacala, particularly in the form of the tegmina, as indicated above under the recorded specimens. A number of males have attenuate tegmina with sharply pointed apices in contrast to the bluntly rounded apices of the type and majority of others. This pointed apex reaches well over the 3rd tergum. There are other slight correlated differences, such as a slightly narrower frontal costa. At first it was suspected that these specimens represented a distinct subspecies. However, both forms were collected together at the same locality and in the series of 47 males from the various localities 7 intergrades were found. Slight variation in the form of the female tegmina is evident, but not nearly as pronounced as in the males.

This species is usually an inhabitant of much more humid areas than other members of the genus, although the localities near Zimapan and Tasquillo do approach desert conditions. The Morelia locality indicates a probable wider distribution than is at present known. A peculiar feature of the male is the small squeaking sound that it makes when picked up in the hand. It appears to be produced by the spiracles and suggests a similar sound made by species of *Taeniopoda* and *Chromacris* (Romaleinae).

TRIGONOPHYMUS Stål

Trigonophymus Stål, 1873, Recensio Orthopterorum, no. 1, p. 77. Type: *Trigonophymus fuscus* (Thunberg) by subsequent designation, Kirby, Syn. Cat. Orth., vol. 3, p. 486, 1910.

The name *Dichroplus*⁴ has been frequently used for this large, chiefly South American genus. As pointed out by Hebard,⁵ the name must be regarded as a synonym unless its genotype can be shown to be generically separable from that of *Trigonophymus*. In any event *T. notatus* is close to the genotype of *Trigonophymus*.

Trigonophymus notatus (Bruner)

Dichroplus notatus Bruner, 1908, p. 301 (type locality: Amula, Guerrero, Mex., 6000 ft.) Hebard, 1917, p. 252.

Trigonophymus notatus (Bruner). Kirby, 1910, Syn. Cat. Orth., III, p. 490.

This species suggests a small, macropterous species of *Melanoplus*, but may be distinguished from other Mexican species by a combination of the following characters: length of male 14 to 19 mm. Disk of pronotum with broad, black, median stripe. Median or discoidal field of tegmina black

⁴ *Dichroplus* Stål, 1873, Recensio Orthopterorum, no. 1, p. 78. Type: *Dichroplus arrogans* (Stål), by subsequent designation, Rehn, 1907, Proc. Acad. Nat. Sci. Phila., vol. 59, p. 187.

⁵ Hebard, 1923, Trans. Amer. Ent. Soc., XLIX, p. 284.

with five or more pale interruptions. Apex of tegmina may extend slightly beyond, but are usually short of distal ends of hind femora. Outer side of hind femora with three black diagonal stripes; ventral side reddish. Hind tibiae blue. The most important feature suggesting its position in the genus *Trigonophymus* is the form of the male terminalia. The subgenital plate or end of abdomen is not swollen or inflated but tapers to a point. Cerci are simple, slender processes.

Specimens.—DURANGO: San Antonio, 5000 ft., VI, 10, 1937, 1 ♂, (A. R. Mead). VERACRUZ: Jalapa, IX, 2, 1933, 2 ♀, (E. Crothers); La Cumbre above Acultzingo, 6000 ft., VII, 26, 1936, 2 ♂. MORELOS: km. 63, above Cuernavaca, 7000 ft., VIII, 7, 1936, 2 ♂, 1 ♀, and VII, 28, 1940, 3 ♂, 3 ♀; above Cuernavaca, 9000 ft., IX, 7, 1936, 1 ♂; Tepoztlan, 5000 ft., VIII, 28, 1938, 2 ♂, 1 ♀. MICHOACAN: Temascal, 23 mi. E. Morelia, 7500 ft., VIII, 24, 1940, 1 ♀; Lake Patzcuaro, 6500 ft., IX, 4, 1938, 2 ♂; between Zitacuaro & Rio Tuxpan, 6000 ft., IX, 1, 1938, 3 ♂, 3 ♀; 5 mi. S. Morelia, rd. to Uruapan, 6-7000 ft., VIII, 16, 1940, 1 ♂, 2 ♀; between Zacapu & Zamora, 7500 ft., IX, 6, 1938, 1 ♂, 1 ♀; between Quiroga & Zacapu, 7000 ft., IX, 6, 1938, 3 ♀; Cojumatlan, Lake Chapala, 4-5500 ft., IX, 8-9, 1938, 1 ♀. JALISCO: 12 miles west of Guadalajara, 5000 ft., IX, 11, 1938, 3 ♂, 2 ♀. GUERRERO: Tazco, VIII, 17, 1935, 1 ♀; Mazatlan, 5000 ft., IX, 14, 1940, 1 ♂, (C. Bolivar & H. R. Roberts); Amula, 6000 ft., VIII, (H. H. Smith) [paratype]; between Omilteme & Amileca, 7000 ft., VIII, 6, 1940, 1 ♂; Omilteme, 30 mi. W. Chilpancingo, 8000 ft., VIII, 4-5, 1940, 6 ♂, 6 ♀; Tixtla, 4500 ft., VII, 31, 1940, 1 ♀. OAXACA: Cerro San Felipe, Oaxaca, 5-6000 ft., VIII, 18, 1938, 1 ♂. CHIAPAS: Tuxtla Gutierrez, VI, 11-27, 1926, 2 ♂, (A. Dampf).

Distribution.—Highlands of Mexico between 5-9000 feet from Durango to Chiapas.

AIDEMONA Brunner

Aidemona Brunner, Ann. Mus. Civico Storia Nat. Geneva, ser. 2, XIII, (XXXIII), p. 145, 1893. Type: *Aidemona azteca* (Saussure), by subsequent designation, Rehn, 1904, p. 536.

Most authors have noted considerable differences in their material from various localities of this hitherto monotypic genus. Upon examination of the aedeagus, three species are now quite evident, and one of these species contains two subspecies. Correlated differences are also to be found in the male cercus. The form of the pronotum and end of the male abdomen indicate relationship with the large South American genus *Trigonophymus*, of which there is one representative in Mexico treated above. The center of dispersal of *Aidemona*, however, is evidently in Mexico, since all four species and subspecies occur there and but one of these ranges from central Mexico to Colombia.

Diagnosis.—Small, macropterous, dull brownish with orange-red on inner face and venter of hind femora, and bluish or fuscous hind tibiae. A characteristic color marking is the pale buffy spot on the ventral margin of the metathoracic epimeron, just above the dorso-proximal margin of the hind femora. This marking is also present on *Trigonophymus notatus*, but readily distinguished from this latter species by lacking the broad, longitudinal stripe on the pronotal disk.

Though not likely to be confused with members of the genus *Melanoplus*, the only important difference apparent is the broad planate pronotal disk and the relatively uninflated end of the male abdomen.

The species are most readily distinguished by the figures of the male genitalia.

Aidemona azteca azteca (Saussure)

Text-figs. 6, 10.

Pl [*atyphyma*] *aztecum* Saussure, 1861, Rev. Mag. Zool., ser. 2, XIII, p. 161 (type locality: Mexico temperata [Orizaba reg. temp.]).

Aidemona azteca (Saussure). Scudder, 1897a, p. 204. Scudder (in part), 1897b, p. 45. Rehn (in part), 1902, p. 15. Bruner (in part), 1908, p. 313. Hebard (in part), 1917, p. 264. Hebard (in part), 1932, p. 286.

I am greatly indebted to Dr. J. Carl of the Museum of Natural History at Geneva, Switzerland, for information concerning Saussure's type series of *A. azteca*, which is contained in their collections. There are three males labeled no. (17), Orizaba, reg. temp., and one of these has been made a lectotype. Drawings by Dr. Carl of the cerci of the three males indicate that they are the subspecies to be found in the lowlands of Veracruz.

*Specimens*⁶

NUEVO LEON: Horse Tail Falls, East of Monterrey, 2200 ft., VII, 27, 1938, 1 juv. ♀. Arroyo Garrapatas, 6 mi. north of Montemorelos, 1600 ft., VII, 17-18, 1936, 1 ♂, 5 ♀.

TAMAULIPAS: swamp country, 6 mi. north of Ciudad Victoria, 1000 ft., VII, 21, 1936, 1 ♂, 2 ♀. El Mante (Villa Juarez), VI, 2, 1931, 1 ♂ (A. Dampf) [Hebard 1932]. 10-35 mi. south of Villa Juarez, 400-1000 ft., VII, 19-24, 1935, 2 ♂, 1 ♀, 1 juv. ♀. Mesa de Llera, 2000 ft., VIII, 1, 1938, 1 ♀.

SAN LUIS POTOSI: 5-10 mi. west of Naranjos (Rio Salto), 500 ft., VIII, 30, 1940, 3 ♂, 4 ♀. Tamazunchale, 500 ft., VI, 18, 1937, 1 ♂ (A. R. Mead). Between Tamazunchale and Chapulhuacan, 400-1000 ft., VII, 29, 1936, 1 ♀.

HIDALGO: Santa Ana above Temazunchale, 4-5000 ft., VII, 27, 1936, 1 ♂.

⁶The following list of records represents material of this species that I have examined. When the specimens were collected by other than the present author, the name of the collector is given in parenthesis. When material has been previously recorded, the author and date follow in brackets. Full bibliographic reference may be found under Bibliography.

PUEBLA: Necaxa, VII, 27-28, 1926, 3 ♂ (H. B. Baker) [Hebard 1932].

VERACRUZ: 5 mi. east of Orizaba, 3000 ft., VIII, 24, 1936, 1 ♂. Fortin, 2500 ft., VIII, 27, 1936, 2 ♂. Texolo, III, 3, 1899, 1 ♂, 1 ♀ (S. N. and N. C. Rhoads) [Rehn 1902]. Coscomatepec, 1580 meters, XI, 30, 1924, 2 ♂, 2 ♀ (A. Dampf). Orizaba, 1, 1892, 2 ♂, 2 ♀ (L. Bruner) [Scudder 1897b]. Orizaba, XII, 1887, 2 ♂, 5 ♀ (H. S. & F. D. G.) [Bruner 1908]. San Rafael, III-VI, 8 ♂, 4 ♀ (collector?) [Hebard 1917]. Xico, 1 ♂, (collector?) [Hebard 1917]. Xico, VIII, 1 ♀ (O. W. Barrett). Otoyac, V & XI, 2 ♂ (H. H. S.) [Hebard 1917]. Medellin, X, 1 ♂, 2 ♀, 1 juv. ♀ (collector?) [Hebard 1917]. Jalapa, VI, 1, 1894, 1 ♂, 1 juv. ♀ (collector?) [Hebard 1917]. Jalapa, IX, 3, 1933, 1 ♂, (E. Carothers). La Cumbre above Acultzingo, 6000 ft., VIII, 25, 1936, 1 ♂.

TABASCO: Teapa, II & III, 3 ♂, 2 ♀ (H. H. S.) [Hebard 1917]. Frontera, I, 1 ♂ (H. H. S.) [Hebard 1917].

CHIAPAS: between Finca Germania and F. Lubeca, 1100 m., VI, 21, 1935, 1 ♂, (A. Dampf).

YUCATAN: Merida, 2 ♂, 1 ♀ (collector?) [Hebard 1917]. Chichen Itza, 6 ♂, 6 ♀, (E. Thompson) [Hebard 1917]. Valladolid, 5 ♂, 2 ♀, (Gaumer) [Hebard 1917].

Distribution.—Eastern lowlands of Mexico from Nuevo Leon south. Some 67 specimens are before me from British Honduras, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Colombia. One of the commonest, widespread species, and the above records show that it may be found at all seasons of the year though doubtless varying in abundance.

Dr. H. F. Strohecher presented to our collections a single male taken by him 18 miles northwest of San Antonio, Bexar Co., Texas on August 11-17, 1940. This is the first record of this subspecies for the United States, but in all probability it is an adventive.

***Aidemonia azteca amrami*⁷ new subspecies**

Text-figs. 7, 11.

Aidemonia azteca (Saussure). Scudder (in part), 1897b, p. 45. Rehn (in part), 1902, p. 15. Rehn, 1904, p. 536. Bruner (in part), 1908, p. 313. Hebard (in part), 1917, p. 264. Hebard, 1925, p. 292. Hebard (in part), 1932, p. 286.

Other than the form of the aedeagus and male cercus it is not distinguishable from *A. azteca azteca*. In *A. a. amrami* the cercus is always broader distad and frequently with a pronounced impression on its lateral face just before the apex. The valves of the aedeagus are much broader and more heavily sclerotized where they flare out and curl latero-ventrad.

Type.—♂; between San Martin and Santa Rosa, Chiapas, Mexico. Elevation 5500-6500 ft. January 25, 1934. (D. W. Amram, Jr.). [Acad. Nat. Sci. Phila., Type no. 5578.]

⁷ Named for Mr. D. W. Amram, Jr. in appreciation of the interesting collection of Orthoptera secured by him in Chiapas and presented to this Academy.

Description.—The following in no way distinguishes this subspecies from *A. azteca azteca* except for the two diagnostic features mentioned above. Size small; macropterous. Fastigium and interocular area slightly impressed or broadly sulcate with slight lateral carinae. Fastigium strongly declivent and rounding smoothly into frontal costa. Face slightly retreating. Frontal costa broad, planate, not impressed. Eyes moderately prominent. Antennae short, rather heavy and slightly compressed. Disk of pronotum nearly planate; lateral margins straight and but slightly convergent cephalad; caudal margin angulate produced (about 45°). Prosternal spine well developed with slight suggestion of bilobation at apex. Tegmina extend slightly beyond the hind femora, with rounded apices.

Subgenital plate simple; lateral margins are straight in lateral aspect, apex blunt in dorsal aspect. Furculae two small adjacent lobes. Cerci thick at base and tapering evenly to apex; distal portion near apex decidedly flattened; axis slightly curved dorso-mesad.

The form of the aedeagus is very distinctive. The sheath, the main part of which is at the end of the rami of the cingulum, is very much reduced. The dorsal and ventral valves are most unusual in their length and the manner in which they curl at their distal portion. The dorsal valves are concealed in the figure by the ventral valves, except for their non-sclerotized, curled, distal portion. The dorsal and ventral valves are connected by thin membrane.

Female.—In general form it is larger but closely similar to the male. The ovipositor valves are moderately slender.

Coloration.—General color dull fuscous brown, paler areas dull buffy brown. Face, ventral half of lateral lobes, ventral surfaces of body, dorso-proximal portion of hind femora relatively pale, though degree of contrast varies greatly according to locality and even among individuals from a single locality. There is no diagonal pale stripe along metathoracic episternum, as frequently occurs in the genus *Melanoplus* and closely related genera. There is, however, a pale spot just above the hind coxae on the metathoracic epimeron. The ventral margin of the pagina of the hind femora has a pale stripe broken by four or five black spots. Ventral and inner face of hind femora yellowish to bright orange-red. Hind tibiae bluish, but individuals varying greatly as to intensity. The general coloration of specimens from arid areas tend to be paler, those from Chiapas, including the type, average much darker.

Measurements.—(Type and ♀ topotype). Length of body ♂ 17, ♀ 21.5; length of antennae ♂ 6.5, ♀ 6; length of pronotum ♂ 4, ♀ 4.9; length of hind femora ♂ 9.6, ♀ 11.2; length of tegmina ♂ 13.5; ♀ 16 mm. These and the series of topotypes from Chiapas average somewhat smaller than those from central and northwestern Mexico.

*Specimens*⁶

U. S. A., ARIZONA: recorded by Ball⁸ et al. from Tumacacori Mission, Santa Rita Mts., Canelo Hills and Tumacacori Mts. In Academy collection: Santa Cruz Valley, X, 23, 1937, 2 ♀ (E. D. Ball). Santa Rita Mts.,

⁸ Ball, Tinkham, Flock and Vorhies, 1942, Univ. Ariz., Tech. Bull. 93, p. 332.

X, 6, 1938, 4200 ft., 1 juv.; X, 27, 1938, 3 ♀; IV, 14, 1939, 4000 ft., 1 ♀; XI, 1, 1939, 3 ♂ (R. A. Flock).

SONORA: Sierra la Chuna, S. Bernardo, 1000 ft., VIII, 2, 1935, 1 ♂ (H. A. Pilsbry).

SINALOA: Venvidio, VI, 24, 1918, 4 ♂, 3 ♀, and IX, 2, 1918, 16 juv. (J. A. Kusche) [Hebard 1925]. Villa Union, IX, 27, 1918, 5 ♂, 1 ♀, 10 juv. (J. A. Kusche) [Hebard 1925]. La Silla Mts., 65 miles east of Dimas, 3100 ft., II, 26, 1938, 2 ♂, 2 ♀ (H. T. Green). Presidio [de Mazatlan], 1 ♀ (Forrer) [Bruner 1908].

NAYARIT: Tepic, 2 juv. (collector ?).

DURANGO: San Antonio, 5000 ft., VI, 10, 1937, 1 ♀ (A. R. Mead).

AGUASCALIENTES: Aguascalientes, IX, 1887, 1 ♂, 2 ♀, (L. Bruner) [Scudder 1897b].

JALISCO: 5 mi. E. Autlan, 2500 ft., VIII, 20, 1940, 3 ♂, 2 ♀. Between Acatlan and Tlajomulco, 5000 ft., VIII, 18, 1940, 1 ♂. Near Sta. Ana, 1500 m., XI, 23, 1934, 1 ♀ (A. Dampf). Near Zapotiltic, 1500 m., XI, 20, 1934, 2 ♂, 1 ♀, 1 juv. (A. Dampf). Guadalajara, 5 ♂, 1 ♀ (Crawford) [Hebard 1917], and VII and VIII, 1903, 1 ♂, 2 ♀ (McClendon) [Rehn 1904]. Zapotlanejo, VII, 31, 1903, 2 ♂ (McClendon) [Rehn 1904]. Zapotlan, VII, 7, 1902, 1 ♂ (McClendon) [Rehn 1904].

MICHOACAN: Apatzingan, 1200 ft., VIII, 8 & 15, 1941, 2 ♀ (Hoogstraal & Haag). Cojumatlan, Lake Chapala, 4000-5000 ft., IX, 8-9, 1938, 1 ♀. Between Sitsio and Copulco, 3-4000 ft., VIII, 14, 1940, 2 ♀. Uruapan, IV, 10, 1899, 2 ♂, 1 ♀ (S. N. & M. C. Rhoads) [Rehn 1902].

MEXICO: Tenancingo, 2300 m., III, 5, 1933, 4 ♂, 1 ♀ (A. Dampf).

MORELOS: Cuernavaca, VI, 1 ♂, 1 ♀ (H. H. Smith & O. W. Barret) [Hebard 1917]. Puente de Ixtla, 3000 ft., VII, 30, 1940. Nepantha, XI, 1 ♀ (O. W. Barret). Jojutla, 890 m., X, 2, 1937, 1 juv. (A. Dampf).

GUERRERO: Tasco, VIII, 17, 1935, 1 ♀. Iguala, 2600 ft., VIII, 8, 1936, 2 ♀. Iguala, 1929, 3 juv. ♂, 3 juv. ♀ (H. Kruge) [Hebard 1932]. Mexcala, Rio Balsas, 1000 ft., VII, 30, 1940, 1 ♂, 1 ♀. Canyon de Zopilotes, Mexcala, 2500 ft., VIII, 17, 1936, 2 ♂, 4 ♀. 4 mi. N. of Chilpancingo, 5000 ft., VII, 30, 1940, 1 ♂, 2 ♀. Chilpancingo, 4600 ft., VI, 2 ♂, 3 ♀ (H. H. Smith) [Hebard 1917]. Amula, 6000 ft., VIII, 1 ♀ (H. H. Smith) [Hebard 1917]. Km. 335, 16 mi. S. of Chilpancingo, 4000 ft., VII, 5, 1940, 3 ♀. Mazatlan, 5000 ft., VIII, 5, 1940, 2 ♀. Rio Cocula, XII, 1898, 1 ♂, 2 ♀ (collector ?) [Hebard 1917]. Dos Arroyos, 1000 ft., IX, 1 ♂ (H. H. Smith) [Hebard 1917]. Tepetlapa, 3000 ft., X, 2 ♂, 1 ♀ (H. H. Smith) [Hebard 1917]. Between Tierra Colorado and Rio Papagayo, 1000 ft., IX, 16, 1940, 3 ♂, 2 ♀. Acapulco, IX, 1 ♂ (H. H. Smith) [Hebard 1917]. Acapulco, VIII, 10-13, 1935, 2 ♂, 2 ♀, 1 juv., and IX, 15, 1940, 5 ♂, 4 ♀.

VERACRUZ: Acultzingo, 4500 ft., IX, 1, 1936, 1 ♂.

OAXACA: Oaxaca, 5000 ft., VIII, 21, 1938, 1 ♂, 1 ♀. Mitla, 5000 ft., VIII, 19, 1938, 1 ♂.

CHIAPAS: In addition to the type there are 9 ♂ and 23 ♀ with similar data. San Gregorio (9 leagues east of San Cristobal), Chiapas, 5800 ft., (pine forest with grass cover), II, 4-5, 1934, 7 ♂, 2 juv. (D. W. Amram, Jr.). Cerro Ococingo, Chiapas, 5000 ft., (pine forest with grass cover), I, 24, 1934, 6 ♂, 4 ♀, 1 juv. (D. W. Amram, Jr.). Ococingo, Chiapas, 950 ft., VII, 26, 1933, 1 ♂ (D. W. Amram, Jr.).

Distribution.—Occurs up to about 5000 ft. from extreme southern Arizona, Pacific slopes of western Mexico and south through Oaxaca and Chiapas. The Veracruz record probably represents an intrusion from the Oaxaca element.

Aidemona alticola ⁹ new species

Text-figs. 8, 12.

Aidemona azteca (Saussure). Scudder (in part), 1897b, p. 45. Hebard (in part), 1917, p. 264.

Other than its average smaller size, this species in general form and color very closely resembles the two subspecies of *Aidemona azteca*. The specialized form of the aedeagus is so strikingly different, however, that it is recognized as a distinct species.

Type.—♂; km. 63 (from Mexico City), above Cuernavaca, Morelos, Mexico. Elevation 7000 ft. August 7, 1936. (H. R. Roberts) [Acad. Nat. Sci. Phila., Type no. 5579.]

May be distinguished from *Aidemona azteca amrami* by the shorter and more slender cerci, by the greater production of the subgenital plate beyond the apex of the supra-anal plate, and by the distinctive form of the aedeagus, cf. figures. In other respects, closely similar to *A. azteca amrami*.

Female.—Closely similar to *Aidemona azteca*, but eyes slightly smaller and disk of pronotum usually broader, especially cephalad. Without males, however, it is exceedingly difficult to distinguish this species with any certainty.

Coloration.—There are no evident color differences to distinguish this species.

Measurements.—(Type and ♀ topotype). Length of body ♂ 16.5, ♀ 21.5; length of antennae ♂ 5.5, ♀ 5; length of pronotum ♂ 3.5, ♀ 4.3; length of hind femora ♂ 8.8, ♀ 11; length of tegmina ♂ 12.5, ♀ 14 mm.

Specimens ⁶

NUEVO LEON: Pablillo, Municipio Galeana, 7-8000 ft., VII, 5-7, 1938, 8 ♂, 4 ♀. HIDALGO: vicinity of Jacala, 7000 ft., VII, 30, 1936, 3 ♂, 2 ♀. Maguez Verde, south of Jacala, 7000 ft., VII, 31, 1938, 1 ♀. DISTRITO FEDERAL: Lomas de Chapultepec, 2400 m., V, 30, 1937, 1 ♀ (A. Dampf).

⁹ An allusion to the high altitude habitat of this species.

Tlalpam, 7500 ft., IX, 5, 1936, 1 ♀. Eslava, 1 ♀ (collector ?) [Hebard 1917]. MEXICO: San Juan Teotihuacan, VIII, 16, 1933, 2 ♂, 1 ♀ (E. Carrothers). Amecameca, I, 5, 1899, 1 ♂ (collector ?) [Hebard 1917]. Valle de Ixtlahuaca, VII, 1, 1931, 1 ♂ (A. Dampf). Forest west of Villa Victoria, 8-9000 ft., VIII, 31, 1938, 1 ♂, 2 ♀. AGUASCALIENTES: Aguascalientes, XI, 1887, 2 ♂ (L. Bruner) [Scudder 1897b]. JALISCO: between Cocula and Tecolotlan, 5000 ft., VIII, 19, 1940, 1 ♂. MICHOACAN: between Zitacuaro and Rio Tuxpan, 6000 ft., IX, 1, 1938, 3 ♂, 2 ♀. Zitacuaro, III, 13, 1938, 1 ♂ (M. J. D. White). Between Zitacuaro and Tuxpan, 5-6000 ft., VIII, 14, 1940, 1 ♀. Temascal, 23 mi. E. Morelia, 7500 ft., 1 ♀. Morelia, 6-8000 ft., IX, 4-5, 1938, 1 ♂, 1 ♀. Lake Patzcuaro, 6500 ft., IX, 4, 1938, 2 ♀. Tancitaro, 6000 ft., VI, 25, 1941, 1 ♂ (Haag). Quiroga, III, 14, 1938, 1 ♂ (M. J. D. White). Between Quiroga and Zacapu, 7000 ft., IX, 6, 1938, 1 ♂, 2 ♀. Between Zacapu and Zamora, 7500 ft., IX, 6, 1938, 1 ♂, 2 ♀. MORELOS: same data as type 6 ♂, 3 ♀, and from same locality VII, 28, 1940, 5 ♂, 2 ♀. Tepoztlan, 5000 ft., VIII, 28, 1938, 1 ♀. GUERRERO: Omilteme, 8000 ft., VII, 1 ♂ (H. H. Smith) [Hebard 1917]. Omilteme, 30 mi. W. Chilpancingo, 8000 ft., VIII, 4-5, 1940, 3 ♂, 2 ♀. Xucumanatlan, 7000 ft., VII, 2 ♂ (H. H. Smith) [Hebard 1917].

Distribution.—Highlands of Mexico between 5-9000 ft. from Nuevo Leon to Guerrero. Most frequently occurs in open, mixed pine and deciduous wooded country.

Aidemona sonorae new species

Text-figs. 9, 13.

This species, based on a single specimen from southern Sonora, is the most distinctive one of the genus. It is most readily distinguished from other forms of the genus by the more prominent eyes, much narrower interocular area, fastigium more declivent and more retreating face. The cerci are straight (not incurved at apices), broad proximad and taper to a sharp apex. The aedeagus lacks entirely the greatly produced, curled aedeagal valves. The finding of *A. azteca amrami* at San Bernardo, not far distant from Alamos, is noteworthy.

Type.—♂; Alamos, Sonora, Mexico. Elevation less than a 1000 ft. August 13, 1935. (Henry A. Pilsbry). [Acad. Nat. Sci. Phila., Type no. 5614.]

Resembles *A. azteca amrami* in general size and appearance but differs from that form in the following respects: antennae longer; eyes decidedly more prominent; interocular area very narrow, so that the two longitudinal carinae of this area, which continue along the sides of the fastigium, form a median longitudinal sulcation instead of a relatively broad depression; fastigium decidedly more declivent and face more retreating; median length of metazona of pronotum less than that of the cephalic portion of pronotum, whereas the reverse is true in all other species of the genus; prosternal spine

narrower distad from caudal aspect, with no suggestion of bilobation; tegmina narrower distad; cerci shorter, about as broad proximad, but apex sharply acuminate and not incurved distad; aedeagal valves projecting but a very short distance beyond the sheath.

Coloration.—Closely similar to *A. azteca amrami* except upper half of lateral lobes of pronotum much darker, almost black in contrast to the very pale ventral portion.

Measurements.—(♂ Type). Length of body 18.5; length of antennae 8; median length of pronotum 4; length of tegmina 14.3; length of hind femur 10 mm.

DACTYLOTUM Charpentier

Text-fig. 1.

Dactylotum Charpentier, 1843, Orthoptera Deser. et Depicta, Lipsae, Tab. 52. Type: *D. bicolor* Charpentier by monotypy.

Poepedetes Saussure, 1861, Rev. Mag. Zool. XIII, p. 158. Type: *O. corallinus* Saussure by monotypy. Hebard, 1932, p. 295.

The group *Dactylota* to include only this genus was proposed by Scudder,¹⁰ and he excluded the genus from his revision of the [Group] *Melanopli* (1897b). Hebard (1917) likewise excluded it from his Notes on Mexican *Melanopli*. Scudder distinguished the group from the *Melanopli* by the 6 to 8 spines on the exterior margin of the hind tibiae. Since a number of Mexican *Melanopli* have 8 to 9 spines and *Oedomerus* and *Psilotettix* have 6 to 7 spines only, this distinction is not valid.

The most divergent features of the genus are the following: the color pattern; the unusual form of the pronotum; and, as observed by Helwig,¹¹ the presence of 17 rather than the usual 23 chromosomes in the spermatogonia. However, Isely¹² has shown that *D. pictum* is distasteful to birds, and hence the unusual coloration is developed as a warning to predators. *Aztecacris*, *Perixerus*, *Philocleon* and *Poecilottettix* are an association of Mexican *Melanopli* likewise brightly colored, though nothing is known of their taste characteristics. The form of the pronotum is certainly divergent from that of *Melanoplus*, but other Mexican genera show equally divergent forms. The significance of the chromosome number is not clear. In some cases the chromosome number may be characteristic for certain subfamilies or higher categories and in other cases a divergent number may occur among related genera. Slifer¹³ has figured the female spermatheca of *Dactylotum* and it has a small knob on the pre-apical diverticulum. This feature is characteristic of a number of *Melanopli* though the genus *Melanoplus* lacks this development.

¹⁰ S. H. Scudder, 1897, Guide to the genera and classification of the North American Orthoptera found north of Mexico, Cambridge, p. 40.

¹¹ E. R. Helwig, 1942, J. Morph., vol. 71, no. 1, p. 10.

¹² F. B. Isely, 1938, Ecology, vol. 19, p. 385.

¹³ E. H. Slifer, 1940, J. Morph., vol. 67, no. 2, p. 223, fig. 41.

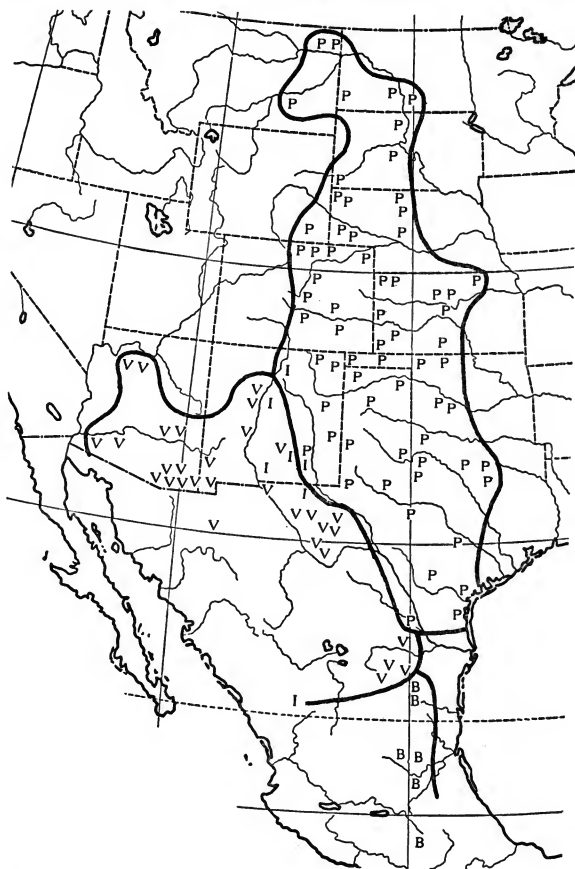


Figure 1.—Map of west central U.S.A. and part of Mexico showing distribution of *Dactyloctenium bicolor bicolor* (B), *D. b. variegatum* (V), and *D. b. pictum* (P). (I) represents intermediates between the two geographically nearest subspecies.

Considering that the above mentioned features do not necessarily exclude *Dactylotum* from the Melanoplini, and since the form of the head and the male terminalia are typical of the Melanoplini, and since the internal phallic structures are very similar to *Aztecacris* (excluding the aedeagus), *Dactylotum* is therefore here placed as a member of the tribe Melanoplini and is considered most nearly related to *Aztecacris* and its associated genera.

Diagnosis.—Recognized by its striking, variegated coloration. Light areas may be pale yellow, greenish yellow, orange, vermilion, or carmine. Often two of these colors are present together. Dark areas may be black, bluish black, violet black, dark lavender, or olive green. Head with very weakly defined fastigium, rounding smoothly with occiput and frontal costa. Interocular area very broad. Pronotum with deep transverse sulci; disk transversely arcuate with no median carina and rounding smoothly into lateral lobes; caudal margin convexly arcuate. Venation of tegminal pads coarsely reticulate and contrastingly colored with cells. Male subgenital plate small, simple; furculae very weakly developed; cerci slender, rod-like.

Coloration.—Great differences of color occur over its extensive distribution, but there is a marked uniformity for any single locality and a general trend over wide areas. For various geographic areas certain generalizations are possible such as: those from Montana, North and South Dakota, Wyoming and most of Nebraska lack the red pigmentation, and the dark pattern is black; those from southern Arizona show the greatest development of the red pattern in the United States; the Big Bend of Texas and northeastern Mexico have a decided dark purplish or lavender cast on the darker areas; for further details refer to comments under each subspecies. These geographic color variations are not recognized by name, because there are such extensive areas of intergradation and variation from one locality to another.

Food plants.—Ball ¹⁴ states that *Baccharis wrightii* Gray is apparently the food plant of *D. b. variegatum* and "The young nymphs are often found in a cluster at the base of this plant, . . ." The distribution given for this plant is Kansas and Colorado to Arizona, western Texas and Mexico. Isely ¹⁵ found by laboratory observation at Waxahachie, Texas that *Baccharis texana* (T. & G.) Gray is the primary host plant for *D. b. pictum*. He also observed that it will feed on *Aster exilis*. He further states, ". . . only found as an occasional specimen unless definitely associated with its primary host plant. . . ." The distribution of *B. texana* is Texas and Tamaulipas, Mexico, and no species of *Baccharis* occurs north of Nebraska. Though *Dactylotum* evidently has considerable food-plant specificity, the

¹⁴ E. D. Ball, 1936, J. Economic Ent., vol. 29, p. 683.

¹⁵ F. B. Isely, 1938, Ecological Monographs, vol. 8, p. 577.

subspecies of *Dactylotum* do not coincide with the species of *Baccharis* and *D. b. pictum* occurs well north of the range of *Baccharis*.

Diagnosis of subspecies.—All of the geographic developments of the genus are placed in one species since no two developments occur together and there is considerable geographic intergradation. The size and shape of the tegminal pad is used as the primary diagnostic character, as it is relatively uniform over wide areas, and the zones of intergradation are relatively narrow between the three subspecies. In *D. b. pictum* the tegmina are decidedly narrower than width of hind femur, the lateral margins are nearly parallel. In *D. b. variegatum* the tegmina are obovate, usually as wide or wider than width of hind femora, and the distal end broadly rounded. In *D. b. bicolor* the tegmina are elliptic, as wide or wider than *variegatum*, and the apex is more or less narrowly rounded or attenuate, see figs. 25-27. The tegmina of some individuals in a series may be subnormal in size.

The aedeagus of a number of males from widely separated localities have been examined. Though there is slight differentiation evident, it is insufficient to serve as a diagnostic character.

There are now some 800 specimens of *Dactylotum* in the collection of the Academy of Natural Sciences which have been used in this study.

***Dactylotum bicolor bicolor* Charpentier**

Plate 6, fig. 27.

Dactylotum bicolor Charpentier, 1843, Orthoptera Descr. et Dipicta, Lipsiae, Tab. 52 (type locality: Mexico). Bruner, 1908, p. 336.

Poepedetes corallinus Saussure, 1861, Rev. Mag. Zool., XIII, p. 158 (type locality: Lake Metztitlan, Hgo., Mexico) see Hebard, 1932, p. 296.

Dactylotum histricum Rehn, 1904, p. 539 (type locality: La Joya, S. L. P., Mexico).

Dactylotum picturatum Bruner, 1908, p. 336 (type locality: Mexico).

The material recorded below from Pablillo, Nuevo Leon, most nearly approaches the green and yellow coloration of Charpentier's colored plate of *D. bicolor*. Though it is unlikely that Charpentier's type specimens came from this locality, it becomes reasonably certain that his material is one of the color developments of this subspecies.

Specimens.—NUEVO LEON: Pablillo, Municipio Galeana, 7-8000 ft., VII, 5-9, 1938, 11 ♂, 6 ♀, 2 juv.; 3 miles east of Ascension, VIII, 27, 1940, 1 ♂, 1 ♀, (E. R. Tinkham) [Tinkham Coll.] SAN LUIS POTOSI: La Joya, VIII, 10, 1903, 2 ♀ (type and paratype of *D. histricum*) (M. E. Hoag); 5 miles east of Ciudad Maiz, 4500 ft., IX, 1, 1940, 1 ♂; 6 miles west of Ciudad Maiz, 4500 ft., IX, 9, 1940, 2 ♂. HIDALGO: 3-8 miles south of Jacala, 5-6000 ft., VII, 30, 1946, 10 ♂, 4 ♀, 15 juv.; Rio Tula, Tasquillo, 5500 ft., VIII, 28, 1940, 4 juv.; Km 196 between Zimapan and Ixmiquilpan, 6000 ft., VIII, 2, 1936, 4 juv.; 19 miles north of Atotonilco Grande, 7000 ft., VIII, 8, 1938, 1 juv. MORELIA: Cuernavaca, March (no other data), 1 ♀ (collector ?).

Intermediates (between *D. b. bicolor* and *D. b. variegatum*). DURANGO: Durango, XI, 27, 1909, 1 ♂, 1 ♀ (F. C. Bishopp) [U. S. Nat. Mus.].

The series from Pablillo has the light areas bright yellow with traces of orange, the dark areas with a bluish green tinge. The pair from Ascension are quite similar to the above series except for pronounced touches of orange red on the pale areas. The 3 ♂ from C. Maiz have the pale areas of bright orange red and pale straw color, dark areas dark purple. The 2 ♀ from La Joya have the pale areas of the head and anterior portion of pronotum vermilion, and more caudal areas yellow. The series from Jacala are bright orange yellow and dark violet. The female from Cuernavaca has the light areas bright vermilion and the dark areas purple black.

The two specimens recorded above from Durango as intermediates show a tegminal development between the *bicolor* and *variegatum* form.

***Dactylotum bicolor variegatum* (Scudder)**

Plate 6, fig. 26.

Pezotettix variegatus Scudder, 1879, Proc. Boston, Soc. Nat. Hist., XX, p. 65 (type locality: Fort Buchanan, Arizona).¹⁶

Dactylotum variegatum (Scudder). Rehn, 1904, p. 539.

Dactylotum flavopictum Bruner, 1908, p. 336 (type locality: Monclova, Coahuila, Mex.) see Hebard, 1932, p. 296.

Though I have not seen Bruner's type of *flavopictum*, on the basis of his description and geographic locality it is almost certainly a synonym of this subspecies. Bruner (1908) used color differences as his chief key character to separate species. As discussed before, this is too variable a feature to be used to distinguish subspecies.

Specimens.—U.S.A., ARIZONA: Maine, Coconino Co.; Rice, Cassadore Range; Broncho Canyon, Black River; Paradise; Douglas; Natames Plateau, near Chrysotile, Gila Co.; Don Luis, Cochise Co.; Carr Canyon, Huachuca Mts., Cochise Co.; Santa Rita Mts.; Palmerlee, Madera Canyon, Santa Rita Mts.; Sycamore Canyon, Patagonia Mts., Santa Cruz Co.; Nogales; South Face of Atacosa Mt., Santa Cruz Co.; foothills of Pajaritos Mts.; Santa Cruz Co.; Bear Valley, Pajaritos Mts.; hilltop N. of Montana Peak, Tumacacori Mts., Santa Cruz Co.; Robles Pass, Tucson Mts., Pima Co.; Kits Peak Rincon, Baboquivari Mts.; Sycamore Canyon, Baboquivari Mts.; Schaeffer Canyon, Baboquivari Mts.; Mt. Mildred, Baboquivari Mts.; Ash Fork; Gila Bend; Mohawk Mts.

NEW MEXICO: Swarts; Sowancee, Valencia Co.; foot of Sandia Mts.; Three Rivers; Silver City; Lordsburg, Grant Co.; Corales, Bernalillo Co.; Pleasanton, Catron Co.; canyon W. N. W. of Hachita Grande Peak,

¹⁶ Scudder recorded his new species from several localities in Arizona, Sonora, and San Diego, California. The correctness of the last locality is most doubtful. Since Scudder designated no type, and after consulting Dr. P. J. Darlington, I select as a lectotype a female from Fort Buchanan, Arizona, collected by E. Palmer, assorting no. 1110, and located in the collection of the Museum of Comparative Zoology.

Hidalgo Co.; Denton Well, Playa Valley, opposite Hachita Grande Peak; San Marcial, Socorro Co.; Messilla Park.

TEXAS: Balmorhea, Reeves Co.; Fort Stockton, Reeves Co.; El Paso; Davis Mts.; Pine Mt. slopes, Davis Mts.; Valentine; Alpine, Brewster Co.; hills west of Ord Mts., Brewster Co.; Marathon, Brewster Co.; canyon behind Pulliam Bluff, Chisos Mts.; Shafter; Marfa, Presidio Co.

MEXICO: Casas Grande, Chihuahua, IX, 1902, 1 ♂, 1 ♀, 1 juv. (W. E. Hughes) [Rehn, 1904]; Mamulique Pass, Nuevo Leon, 1800 ft., VII, 10, 1936, 24 ♂, 6 ♀, 6 juv., Higueros (between Monterrey and Saltillo) Coahuila, 4000 ft., IX, 14, 1936, 12 ♂, 6 ♀; 6 miles west of Saltillo, Coahuila IX, 15, 1936, 4 ♂, 1 juv.

Intergrades (between *D. b. variegatum* and *D. b. pictum*). U.S.A. NEW MEXICO: Valverde; Albuquerque; Elk; La Cueva, Organ Mts.; Hope; Eddy Co. TEXAS: Frijole; Culbertson Co.; Last Chance Valley, Guadalupe Mts.

Specimens from Arizona show the most extensive color development of vermilion and the pronotum often shows a fading out of the dark pattern. Those from Brewster Co., Texas have the pale areas largely yellow with but occasional traces of red, the dark areas have a lavender or purple tinge. The specimens from the general area of Monterrey and Saltillo, Mexico are quite similar to those from Brewster Co.

Dactylotum bicolor pictum Thomas

Plate 6, fig. 25.

Pezotettix picta Thomas, 1870, Proc. Acad. Nat. Sci. Phila., p. 78 (type locality; eastern Colorado).

Pezotettix flavoannulatum La Munyon, 1877, Proc. Neb. Assoc. Adv. Sci., 1 p.¹⁷ (type locality: high plains of Nebraska). Scudder, Canadian Ent., XII, p. 75, 1880.

Specimens.—U.S.A., MONTANA: Nashua; Forsyth; Culbertson. NORTH DAKOTA: Hazelton; Mandan; Sentinel Butte. SOUTH DAKOTA: Capa; Mowbridge; Hot Springs. NEBRASKA: Valentine; Halsey; Glen, Sioux Co.; Calloway; Box Butte; Sidney, Cheyenne Co.; between Bridgeport and Chimney Rock, Morrill Co. WYOMING: Laramie. COLORADO: Denver; Poudre R.; Ft. Collins; Garden of the Gods, Colorado Springs; La Junta; Baculite Mesa, Pueblo Co.; Baxter, Pueblo Co.; Julesburg, Sedgwick Co.; La Junta, Otero Co.; Kuner. KANSAS: Scott Co.; Graham; Washington Co.; Osborne Co.; Russell Co.; Barbour Co.; Rooks Co.; Rawlins Co.; Grant Co.; Cheyenne Co. SYRACUSE: Morton Co. OKLAHOMA: Cherokee; Buffalo; Thomas; Hydro, Caddo Co.; Guymon; Kenton. TEXAS: Dallas; May Pearl; Waxahachie; Red Oak, Ellis Co.; Auburn, Ellis Co.; Weatherford, Parker Co.; Plains, Yoakum Co.; Taylor Co.; Austin; Beeville, Bee Co.; Kingsville; Cisco, Eastland Co.; Comanche Co.; Seymour; Menard Co.; Hondo; Canadian; Dalhart; Happy Crossing, Randall Co.; Childress; Midland, Midland Co.; Ira. NEW MEXICO: Clifton House, Colfax Co.; Koebler;

¹⁷ See Scudder, 1901, Occ. papers Boston Soc. Nat. Hist., VI, p. 369.

Clayton, Union Co.; Tucumcari; Roswell; Clovis; Cameo, Roosevelt Co.; Maxwell, Colfax Co.; Cerro del Corazon, Osler.

This subspecies is chiefly limited to the Great Plains of the United States.

PERIXERUS Gerstaecker

Perixerus Gerstaecker, 1873, Stett. ent. Zeit., no. 4-6, April-June, XXXIV, p. 192.

Type: *Perixerus squamipennis* Gerstaecker by monotypy.

Hermistria Stål, 1873, Recensio Orthopt., pt. 1, p. 33. Type: *Hermistria pulchripes* Stål by monotypy.

The priority of the above two names for this genus is not evident, but following the description of *Perixerus* it is stated that it was published in early April. In view of this, and since *Perixerus* has had greater usage, I tentatively select this name as the valid one for the genus.

Although *Aztecacris laevis*, *A. variabilis*, *A. gloriosa* and *Dasyscirtus hirsutus* were described as members of this genus, it is now considered monotypic.

Diagnosis.—For general features see figs. 16 and 17. General body surface heavily pubescent; head and pronotum strongly rugulose; tegminal pads with veins reticulate, reddish brown with cells deeply impressed or areolate and contrastingly pale in color. Male terminalia relatively similar to *Dasyscirtus*: furculae absent and tenth tergum deeply emarginate at median point; cerci flattened or compressed distad with rounded apex; subgenital plate conical terminating with a slight tubercle.

Perixerus squamipennis Gerstaecker

Plate 6, figs. 16-17.

Perixerus squamipennis Gerstaecker, 1873, loc. cit., p. 192 (type locality: Mexico).

Rehn, 1904, p. 541. Bruner, 1908, p. 333. Hebard, 1932, p. 293.

Hermistria pulchripes Stål, 1873, Recensio Orthopt., p. 52 (type locality: Mexico).

Bruner, 1908, p. 334. Hebard, 1932, p. 293. Sjöstedt, 1932, Arkiv. Zool., K. Sven. Vet.-Akad., vol. 24A, no. 1, p. 31 (type figured).

Evidently a quite scarce and localized species. At the time when the specimens recorded below were collected but very few of the individuals observed had reached maturity. In addition to the diagnostic features mentioned for the genus the paler areas of the hind femora (c.f. figs. 16, 17) and proximal portion of hind tibiae are lemon yellow.

Specimens.—PUEBLA: km. 226 (from Mex., D.F.) northeast of Tehuacan, 6500 ft., VIII, 26, 1936, 5 juv.; road north from Tehuacan near La Cumbre, 5500 ft., VIII, 26, 1936, 1 ♀. VERACRUZ: La Cumbre above Acultzingo, 6000 ft., VIII, 25, 1936, 4 ♀, 1 ♂ 8 juv., and IX, 1, 1936, 2 ♂.

DASYSCIRTUS Bruner

Dasyscirtus Bruner, 1908, p. 303. Type: *Dasyscirtus olivaceus* Bruner by monotypy.

Quite closely related to *Perixerus*. This genus is now extended to include *D. hirsutus* (Hebard) in addition to the genotype. The wing pads are small as in *Aztecacris* not meeting over the dorsum of the abdomen. The male

cerci are compressed distad as in *Perixerus* and in contrast to the cylindrical, acuminate cerci of *Aztecacris*. The juvenile stages of both species are black with red markings on head and pronotum, rather suggesting *Aztecacris laevis*.

***Dasyscirtus olivaceus* Bruner**

Dasyscirtus olivaceus Bruner, 1908, p. 303 (type locality: Cuernavaca, Morelos, Mex.).

General color olive green and red on the underside of the hind femora. *D. hirsutus* is likewise red on the hind femora, but easily distinguished by the darker general color, and the brilliant yellow of the dorso-median line, vertex, frontal costa and sides of head, posterior margin of pronotum, and dorsum of hind femora.

Specimens.—MORELOS: Cuernavaca, I, 4 1899, 1 ♂ type (C. C. Deam) [Bruner]; Cuernavaca, 4500 ft., VIII, 1, 1935, 5 juv. and VIII, 18, 1936, 3 juv. and IX, 7, 1936, 7 ♂, 4 ♀, 14 juv.

***Dasyscirtus hirsutus* (Hebard)**

Perixerus hirsutus Hebard, 1935, Mitt. Zool. Mus. Berlin, vol. 20, pt. 3, p. 444 (Type locality: Tezquitzin, near Chilapa, Guerrero, Mex.).

The important features of the hitherto unknown male follow. Color and general form similar to female. Form of terminalia surprisingly similar to *Perixerus squamipennis*. Posterior margin of subgenital plate extending straight in lateral aspect from margin of ninth tergum to posterior end where a conical projection is developed. Cerci broad, tapering slightly to apex; apex broadly rounded; distal third of cercus bent mesad. Furculae absent. Refer to species above for distinguishing color pattern.

Specimens.—GUERRERO: Paratypes (type locality), X, 1929, 3 ♀ (L. Schultze) [Hebard]; 4 miles north of Chilpancingo, 5000 ft., IX, 17, 1940, 3 ♂, 5 ♀, 2 juv.; Mazatlan, 5000 ft., IX, 14, 1940, 1 ♂, 2 ♀.

AZTECACRIS new genus

Genotype.—*Perixerus laevis* Rehn.

The genus is erected to include the three species *A. laevis* (Rehn), *A. variabilis* (Rehn), and *A. gloriosa* (Hebard). They were described under the genus *Perixerus*, but the genotype *P. squamipennis* was not available for comparison at that time. It is now evident that these species form a cohesive and distinct element. They are related to *Perixerus* and *Dasyscirtus* in some features, compare *Dasyscirtus olivaceus* and *A. variabilis*, and in other features to *Poecilotherium*, compare *P. longipennis* and *A. gloriosa*.

Description.—Body but very slightly pubescent. Head with interocular area broad; fastigium declivent bluntly rounding into frontal costa. Pronotum with no median carina and transverse sulci poorly developed; pronotal disk with no defined lateral margins, rounding smoothly into lateral lobes; caudal margin of disk transverse to weakly produced. Tegminal pads lobate, extending to middle of second tergum; dorsal margins nearly

meeting in *A. gloriosa*, widely separated in the other two species. Male terminalia quite similar in all three species; furculae absent; cerci nearly straight, subcylindrical, tapering evenly from a heavy base to a pointed apex; subgenital plate in lateral aspect straight with a conical protuberance at its caudal end. All three species are brightly colored with red or yellow; hind tibiae pale blue.

Diagnosis.—Most nearly resembling *Dasyiscirtus* by general appearance, unusual coloration and the lobate wing pads. Distinguished by: lack of marked pubescence (may be seen without aid of lens in *Dasyiscirtus* and *Perixerus*); pale blue hind tibiae; male cerci slender, acuminate, not flattened distad.

***Aztecacris laevis* (Rehn)**

Perixerus laevis Rehn, 1900. Trans. Amer. Ent. Soc., XXVII, p. 98 (type locality: Eslava, D. F., Mex.). Bruner, 1908, p. 334. Hebard, 1932, p. 294.

Diagnosis.—General coloration of dorsum olive black, with median stripe on head and pronotum, ventral half of lateral lobes of pronotum, and sides of head below eyes bright vermilion. Male cerci extend distad to apex of supra-anal plate.

Specimens.—In addition to all those recorded by Rehn, Bruner and Hebard I have before me. VERACRUZ: Acultzingo, 4500 ft., IX, 1, 1936, 12 ♂, 16 ♀, 1 juv. DISTRITO FEDERAL: San Carlos, km. 18, road to Toluca, 8000 ft., VIII, 21, 1936, 3 ♂, 1 ♀; Desierto de los Leones, 8500 ft., VIII, 20, 1936, 1 juv.; Las Cruces, 10,000 ft., VIII, 20, 1936, 1 juv. MICHOACAN: between Zitacuaro and Rio Tuxpan, 6000 ft., IX, 1, 1938, 9 ♂, 5 ♀, 2 juv.; Temascal, 23 miles east of Morelia, 7500 ft., VIII, 24, 1940, 1 ♀; Morelia, 6-8000 ft., IX, 4-5, 1938, 6 ♂, 5 ♀; Lake Patzcuaro, 6500 ft., IX, 4, 1938, 6 ♂, 6 ♀; Zamora, 5-5500 ft., IX, 8, 1938, 1 ♂; between Zacapu and Zamora, 7500 ft., IX, 6, 1938, 2 ♂, 1 ♀; Cojumatlan, 4-5500 ft., VIII, 18, 1940, 2 ♂, 1 ♀. JALISCO: between Guadalajara and Chapala, 5500 ft., IX, 13, 1938, 1 ♂, 12 miles west of Guadalajara, 5000 ft., IX, 11, 1938, 1 ♂, 1 ♀; between Acatlan and Tiajamulco, 5000 ft., VIII, 18, 1940, 2 ♀.

Distribution.—Highlands of central Mexico from Veracruz to Jalisco and most commonly found in September and October in open scrub-grass country.

***Aztecacris variabilis* (Rehn)**

Perixerus variabilis Rehn, 1904, p. 541 (type locality: Guadalajara, Jalisco, Mex.). Bruner, 1908, p. 335.

Diagnosis.—Lacks any red coloration. Male cerci short, acuminate processes decidedly shorter than the supra-anal plate.

Specimens.—JALISCO: Guadalajara, IX, 18, 1903, 1 ♀ type, (J. F. McClendon) [Rehn]; 26 miles west of Guadalajara, 4500 ft., IX, 11, 1938, 20 ♂, 15 ♀; Tequila, 4300 ft., IX, 12, 1938, 4 ♂, 4 ♀; between Tecolotlan and

Colotitlan, 4000 ft., VIII, 23, 1940, 1 ♂; Colotitlan, 4500 ft., VII, 19, 1940, 2 ♂, 1 ♀, 1 juv.; between Cocula and Tecolotlan, 5000 ft., VIII, 19, 1940, 1 ♂, 3 ♀.

Distribution.—Only known from vicinity of Guadalajara and a short distance to the west. Probably will be found to have a considerably wider distribution to the west and north.

***Aztecacris gloriosa* (Hebard)**

Perixerus gloriosa Hebard, 1935, Trans. Amer. Ent. Soc. LXI, p. 126 (type locality: south slopes of Atacosa Peak, Pajaritos Mountains, Arizona, U. S. A., 5500-6200 ft., September).

This species has been taken only from the vicinity of the type locality within sight of the Mexican border, and is included here because its distribution surely extends south into Mexico.

POECILOTETTIX Scudder

Peocilotettix Scudder, 1897a, pp. 203 and 206. Type: *Poecilottettix picticornis* (Thomas), a synonym of *P. pantherinus* (Walker), by monotypy. Scudder, 1897b, p. 385.

Both species of this genus are macropterous and distinctive in their color. The male terminalia are suggestive of *Aztecacris* except that there are small furculae present. A relationship to *Hesperotettix* is suggested by the general form of *P. longipennis*. This latter species is not known south of Arizona, U.S.A., but in all probability occurs in Mexico.

***Poecilottettix pantherinus* (Walker)**

Acridium pantherinus Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV, p. 623 (type locality: Mexico).

Poecilottettix pantherinus (Walker). Rehn, 1904, p. 538. Bruner, 1908, p. 329.

Caloptenus (Hesperotettix) picticornis Thomas, 1877, Proc. Davenport Acad. Sci., II, p. 124 (type locality: Arizona). Synonymized by Rehn, 1904, p. 329.

Poecilottettix picticornis (Thomas). Scudder, 1897a, p. 206 and 1897b, p. 385.

The bright yellow body color speckled with black easily distinguishes this species from all others. No feature including the aedeagus was found to differentiate specimens from Guerrero and Jalisco, and those from Arizona.

Specimens.—NAYARIT: Tepic, 1 ♂, 1 ♀ (collector ?) [Bruner, 1908]. JALISCO: Tequila, 4300 ft., IX, 12, 1938, 1 ♂; 12 miles west of Guadalajara, 5000 ft., IX, 11, 1938, 8 ♂, 6 ♀; between Guadalajara and Chapala, 5500 ft., IX, 13, 1938, 2 ♀; Guadalajara, IX, 18, 1903, 1 ♂, (J. F. McClendon) [Rehn, 1904]; 5 miles east of Autlan, 2500 ft., VIII, 20, 1940, 2 ♂; between Cocula and Tecolotlan, 5000 ft., VIII, 19, 1940, 1 ♀; July, 1 ♀, (Schumann) [Bruner, 1908]. GUERRERO: 20 miles south of Chilpancingo, 3500 ft., VIII, 16, 1936, 4 ♂, 4 ♀; km. 235, 16 miles south of Chilpancingo, 4000 ft., VIII, 8, 1940, 4 ♂, 5 ♀.

Distribution.—Pima and Santa Cruz counties of southern Arizona and in Nayarit, Jalisco and Guerrero. Probably in the intervening area.

HESPEROTETTIX Scudder

Hesperotettix Scudder, 1876, Bull. U. S. Geol. & Geog. Surv. Terr., II, p. 262. Type: *Hesperotettix viridis* (Thomas) by monotypy.

Seven species, including *H. viridis* which has five subspecies, occur within the United States, and but one subspecies so far as known occurs in Mexico.

Hesperotettix viridis viridis (Thomas)

Caloptenus viridis Thomas, 1872, Prelim. Rept. U. S. Geol. Surv., Montana and Territ., 5th Rept., p. 450, (type¹⁸ locality: "Colorado, Wyoming, Kansas," U. S. A.).

Hesperotettix meridionalis Scudder, 1897b, p. 59 (type¹⁹ locality: Guanajuato, Mex.). Rehn, 1904, p. 537. Bruner, 1908, p. 315. Hebard, 1917, p. 265.

All of the material that I have seen belongs to this species except a specimen labeled Orizaba and reported by Scudder (1897b) as *H. pratensis*. It is correctly determined, but I concur with Hebard (1917) in believing it is mislabeled and never came from Mexico. Hebard also states, "[I] - - can find no material of *H. speciosa* from northern Chihuahua as recorded by Bruner [1908, p. 315] and do not believe the species occurs in that region." Scudder and subsequent authors recorded specimens of *Hesperotettix* from Mexico as *H. meridionalis* with the exception of those mentioned above. *H. meridionalis* was considered to be darker and more intensively colored than typical *H. viridis*. Observing the wide range of variation of *H. viridis viridis* from the United States as shown by the large series in the Hebard North American Collection, and also the series before me from Mexico, there is no evident means of distinguishing Mexican material. Therefore *H. meridionalis* is here made a synonym.

Specimens.—NUEVO LEON: 15 miles west of Monterrey, 3000 ft., VII, 16, 1936, 4 ♂, 9 ♀; Galeana, 5000 ft., VII, 13, 1938, 1 ♂, 1 ♀; Pablillo, Municipio Galeana, 7-8000 ft., VII, 9, 1938, 9 ♂, 4 ♀. COAHUILA: Higueros, between Monterrey and Saltillo, 4000 ft., IX, 14, 1936, 1 ♀; 20 miles west of Saltillo, 4000 ft., IX, 14, 1936, 2 ♂. DURANGO: Durango?, 1 ♂ (O. W. Barrett) [Hebard, 1917]. SAN LUIS POTOSI: La Joya, VIII, 10, 1903, 1 ♀ (M. E. Hoag) [Rehn, 1904]; 27 miles northeast of San Luis Potosi, 4000 ft., IX, 8, 1940, 1 ♂, 2 ♀. HIDALGO: Tula River, Tasquillo, 5500 ft., IX, 9, 1936, 4 ♂, 7 ♀. JALISCO: 26 miles west of Guadalajara, 4500 ft., IX, 11, 1938, 1 ♂, 1 ♀; Tequila, 4300 ft., IX, 12, 1938, 5 ♂, 2 ♀; between Guadalajara and Chapala, 5500 ft., IX, 13, 1938, 1 ♂.

Distribution.—From South Dakota, Kansas and Texas west to Washington and California, and south to Jalisco and Hidalgo.

¹⁸ A large cotype series dried from alcohol is in the U. S. Nat. Mus. No single type has been selected.

¹⁹ Selected by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., vol. 64, 1912, p. 75.

PHILOCLEON Scudder

Philocleon Scudder, 1897a, pp. 204 and 206. Type: [*Pezotettix*] *nigrovittatus* Stål, by monotypy.

Zacatacris Hebard, 1932, p. 293. Type: *Zacatacris scudderi* Hebard, by original designation.

With many more specimens and an additional species and new subspecies it is now evident that the monotypic genus *Zacatacris* is congeneric with *Philocleon*. The outstanding feature of the genotype of *Zacatacris* is the absence of tegmina and auditory tympana. A parallel situation occurs in *Netrosoma* where the most arid representative of that genus has likewise become apterous.

Diagnosis.—Apterous or tegminal pads small and linear. Hind tibiae markedly incurved distad. Surface, especially hind tibiae, pubescent. Male cerci simple, slightly flattened distad, and distal half bent mesad.

Key to the species of Philocleon

1. Apterous and auditory tympana absent *P. scudderi*
 Small narrow tegminal pads, just covering auditory tympana 2
2. Pagina of hind femora entirely green; hind tibiae light blue *P. anomalus*
 Pagina of hind femora usually black, sometimes dull olive green, with a broad prominent yellow stripe along ventral margin; hind tibiae dull bluish slate with extensive areas of black *P. nigrovittatus*

Philocleon scudderi (Hebard)

Plate 6, fig. 18.

Zacatacris scudderi Hebard, 1932, p. 295 (type locality: Camacho, Zacatecas, Mex.).

[non] *Philocleon nigrovittatus* (Stål). Scudder, 1897b, p. 396, Bruner, 1908, p. 330.

This colorful species was usually encountered in weed vegetation of desert areas. The specimens taken in the very arid area to the west of Saltillo are decidedly smaller than those found to the south, which reflects the more rigorous habitat of this northern area. The little, apterous *Netrosoma nigropleura* was also found at this northern locality.

Specimens.—COAHUILA: 20 miles west of Saltillo, 4000 ft., VII, 16, 1936, 11 ♂, 7 ♀; same locality, IX, 14, 1936, 3 ♂, 4 ♀; Gomez Farias, VIII, 29, 1935, 1 ♀. SAN LUIS POTOSI: Catorce, VIII, 28, 1935, 1 ♂, 2 ♀; 15 miles northeast of San Luis Potosi, 6500 ft., IX, 3, 1940, 17 ♂, 19 ♀; km. 60-70 east of San Luis Potosi, 5-6000 ft., IX, 6, 1940, 14 ♂, 14 ♀; km. 160 east of San Luis Potosi, 4000 ft., IX, 8, 1940, 4 ♂, 4 ♀; 5 miles east of Ciudad Maiz, 4500 ft., IX, 1, 1940, 2 ♀. ZACATECAS: Camacho, XI, 1887, 4 ♂ (including type), 5 ♀ (L. Bruner) [Scudder, 1897b].

Philocleon anomalus Roberts

Philocleon anomalus Roberts, 1941, Notulae Naturae, no. 76, p. 1 (type locality: km. 335 (from Mexico City) 16 miles south of Chilpancingo, Guerrero, Mex., 4000 ft.).

The virtual absence of yellow and red in the color pattern of this small species is indicative of its relatively more humid habitat. The chromosome

condition of the species is most unusual, as described by Dr. Edwin R. Helwig,²⁰ in that the spermatogonia contain 12 instead of the usual 23 chromosomes, all but one of the chromosomes being a multiple. The specimens, as previously reported, are from the type locality and Morelia, Michoacan.

***Philocleon nigrovittatus nigrovittatus* (Stål)**

Text-fig. 14.

Pezotettix nigro-vittatus Stål, 1875, Bih. Svenska Vet.-Akad. Handl., III, no. 14, p. 32 (type locality: Mexico). Stål, 1878, *ibid.*, V, no. 9, p. 15.

Philocleon nigrovittatus (Stål). Scudder, 1897a, p. 206. Hebard, 1932, p. 294.

Refer to *P. n. spatulatus* and figures for diagnosis of the subspecies. As frequently occurs in a brilliantly colored species, there is here a considerable range of color development according to the geographic locality. The Cuernavaca series shows the most extensive development of the black pattern and the total absence of the red which is replaced by either the yellow or black. Specimens from Colima show the greatest reduction of the black areas and the red areas are most extensive.

Specimens.—MORELOS: 1 ♀, (A. Koebele) [Hebard, 1932]; Cuernavaca, 4500 ft., IX, 7, 1936, 13 ♂, 11 ♀; Tepoztlan, 5000 ft., VIII, 28, 1938, 5 ♂, 1 ♀. GUERRERO: km. 234, between Iguala and Rio Balsas, 2000 ft., IX, 13, 1940, 1 ♀.²¹ MICHOACAN: Morelia, 6-8000 ft., IX, 4-5, 1938, 2 ♂, 3 ♀; Cojumatlan, Lake Chapala, 4-5000 ft., IX, 8-9, 1938, 7 ♂, 4 ♀. JALISCO: between Guadalajara and Chapala, 5500 ft., IX, 13, 1938, 2 ♀; Guadalajara, IX, 14, 1903, 1 ♀, (J. F. McClendon) [Hebard, 1932]; Colotitlan,²² 4500 ft., VIII, 19, 1940, 13 ♂, 9 ♀; Tequila 4300 ft., IX, 12, 1938, 5 ♂, 2 ♀. COLIMA: Vulcano, 5 ♂, 4 ♀, (L. Conrad) U.S.N.M. Coll.

***Philocleon nigrovittatus spatulatus* ²³ new subspecies**

Text-fig. 15.

The only feature that distinguishes this subspecies from the nominate form is the prominently raised area at the end of the supra-anal plate in the male, compare figures. Examples of both subspecies were taken near Morelia and Guadalajara. In both cases *P. n. nigrovittatus* lacked any yellow spots or areas in the black lateral stripe of the pronotum, whereas *P. n. spatulatus* had them present. However, series of *P. n. nigrovittatus* from some other localities do develop these yellow spots, so that this feature can not be used as a criterion. The cerci, subgenital plate, and aedeagus are all very similar among members of this genus.

Type.—♂; Morelia, Michoacan, Mexico. Elevation 6-8000 ft. September 4-5, 1938. (H. R. Roberts) [Acad. Nat. Sci. Phila., Type no. 5724.]

²⁰ Multiple chromosomes in *Philocleon anomalus*, Helwig, J. Morph., vol. 69, no. 2, pp. 317-327, 1941.

²¹ As no males were taken here, the subspecies is uncertain. It is a large brilliantly colored specimen in contrast to the Cuernavaca series.

²² I am not able to find this town on any map, but it is not far from Tecolatlán.

²³ An allusion to the spatulate shape of the apical portion of the supra-anal plate.

Description.—Size medium large, noticeably pubescent, and bright contrasting color of black, red and yellow. Fastigium strongly declivent and smoothly rounding into frontal costa. Interocular area broad, broader than frontal costa. Antennae relatively long, about equal in length to hind femur. Pronotum smoothly rounding from dorsum to lateral lobes, no lateral carinae and almost no evidence of dorso-median carina; metazona short with transverse caudal margin. Prosternal spine bluntly conical. Tegmina small, narrow with apices rounded and just covering auditory tympana; venation reticulate with no pronounced longitudinal veins. Hind femora robust and genicular lobes markedly broad and broadly rounded distad. Hind tibiae with distal portion in the retracted position upcurved towards the hind femora and slightly incurved.

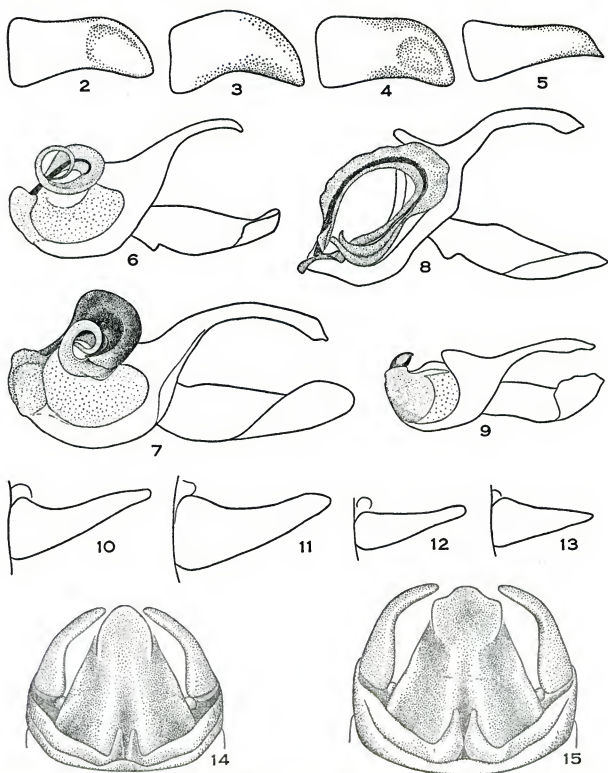
Supra-anal plate (cf. figs. 14, 15) with apical area decidedly elevated above the plane of the more basal portions; some variation is evident in the contour of the apical margin, the type is entirely convex arcuate, others are convex arcuate mesad and recurved laterad; lateral margins of this apical area in this subspecies are markedly more elevated above the lateral margins of the basal portion of the supra-anal plate as compared with *P. n. nigrovittatus*. Cerci in lateral aspect broad at base, becoming slender and cylindrical in median area, from thence becoming slightly compressed or flattened to the apex; distal half strongly incurved. Furculae of tenth tergum well developed as shown in figure, but somewhat variable. Subgenital plate with caudal margin transverse; for general form see figs. 1 and 2 of *P. anomalus* Roberts, Not. Nat., no. 76, 1941. The aedeagus shows no specialization among species of this genus and consists of two short simple paired processes.

Female. Similar in general form to the male, but larger and decidedly more robust. Apices of dorsal pair of ovipositor valves very strongly upcurved.

Coloration. Ground color light greenish yellow. A black dorso-median, longitudinal stripe extends from the fastigium back over the abdomen. This stripe is broken by yellow areas on head and abdomen, and the metazonal area of the pronotum is red in the males and some females. A lateral, irregular, black stripe extends from the posterior margin of the eyes over the dorsal half of the lateral lobes of the pronotum, tegmina, and sides of the abdomen. Antennae reddish brown. Dorsal margin of tegmina yellowish, remainder largely black. Outer face of hind femora largely black with wide yellow stripe along ventral margin of pagina; dorsal and ventral areas of hind femora extensively red in males and some females; proximal $\frac{1}{3}$ of genicular lobes black, distal $\frac{2}{3}$ yellowish white. Hind tibiae largely black in type, but in other males and females there are areas of dull bluish grey.

Measurements.—(Type and ♀ topotype) length of body ♂ 19.5, ♀ 26; length of antennae ♂ 11, ♀ 11; length of pronotum ♂ 5, ♀ 6.5; length of tegmina ♂ 3, ♀ 3.8, length of hind femora ♂ 11.5, ♀ 16 mm.

Specimens.—MICHOCAN: same data as type, 6 ♂, 1 ♀; Lake Patzcuaro, 6500 ft., IX, 4, 1938, 1 ♂, 1 ♀; Zamora, 5-5500 ft., IX, 8, 1938, 1 ♂. JALISCO: 26 miles west of Guadalajara, 4500 ft., IX, 11, 1938, 6 ♂, 1 ♀; Tequila, 4300 ft., IX, 12, 1938, 1 ♂.



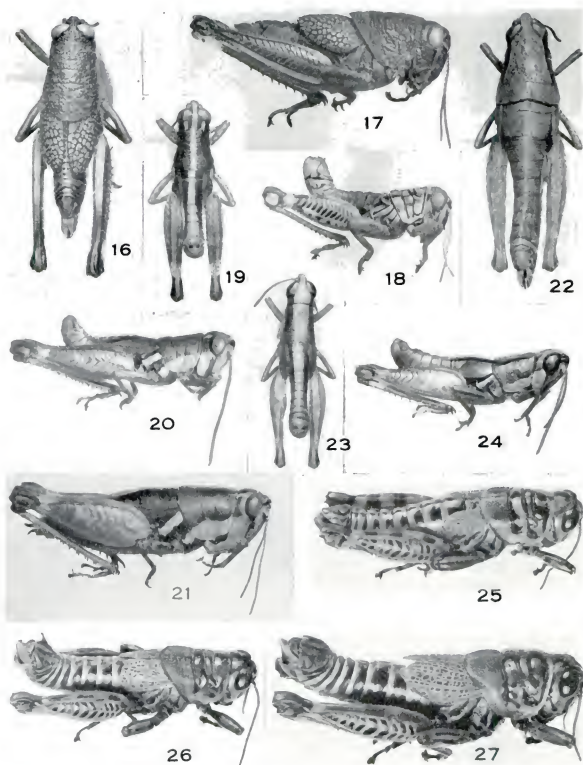
Figs. 2-5, left male cercus; fig. 2, *Netrosoma nigropleura* (type); fig. 3, *Netrosoma fusiforme* (Mamulique Pass, N. L., Mex.); fig. 4, *Netrosoma xanthops* (type); fig. 5, *Netrosoma rubricorne* (type).

Figs. 6-9, right lateral aspect of aedeagus and phallic sclerites. Figs. 10-13, left male cercus. Figs. 6 & 10, *Aidemona azteca azteca* (10 mi. S. Villa Juarez, Tamps., Mex.); figs. 7 & 11, *Aidemona azteca amrami* (type); figs. 8 & 12, *Aidemona alticola* (type); figs. 9 & 13, *Aidemona sonorae* (type).

Figs. 14-15, dorsal aspect of male supra-anal plate, cerci, and caudal tergites; fig. 14, *Philocleon nigrovittatus nigrovittatus* (Cojumatlan, Lake Chapala, Mich., Mex.); fig. 15, *Philocleon nigrovittatus spatulatus* (26 mi. W. Guadalajara, Jal., Mex.).

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ROBERTS: MEXICAN MELANOPLINI

Figs. 16-17, *Perixerus squamipennis* (La Cumbre, above Acultzingo, Ver., Mex.). Fig. 18, *Philocleon scuderi* (20 mil. W. Saltillo, Coah., Mex.). Figs. 19-21, *Netrosoma rubricorne* (type and ♀ from same locality). Figs. 22-24, *Netrosoma xanthops*, fig. 22 (3-8 mi. N. Jacala, Hgo., Mex.); fig. 23 & 24 (type). Fig. 25, *Dactylotum bicolor pictum* (La Junta, Colo., U.S.A.). Fig. 26, *Dactylotum bicolor variegatum* (Santa Rita Mts., Ariz., U.S.A.). Fig. 27, *Dactylotum bicolor bicolor* (6 mi. W. Ciudad Maiz, S.L.P. Mex.).

ABSTRACT OF MINUTES OF THE PROCEEDINGS OF
THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

February 18, 1947

One hundred and thirty-fifth Annual Meeting of the Academy.

Four hundred and eleven members and guests present.

President Charles M. B. Cadwalader in the chair.

The annual report for the year 1946 was presented by the President. This report covered the work of all the scientific departments, as well as the Library, Educational, Museum Exhibits and Photographic departments.

The President also reported the death during the year 1946 of three important key men from the Academy: Arthur E. Newbold, Jr., Treasurer; Roswell C. Williams, Jr., Research Associate, and Morgan Hebard, Research Fellow, both in the Department of Entomology.

The Assistant Treasurer made a report covering the finances of the institution.

The President reported the election of Mr. Brandon Barringer, Vice President of The Pennsylvania Company for Insurances on Lives and Granting Annuities, as the new Treasurer of the Academy.

The President also reported the appointment of Dr. H. Radclyffe Roberts, a member of the scientific staff, as Managing Director of the institution.

During the year 1946 a total of 212 new members were elected to the Academy in the following classes: Annual, 155; Junior, 44; Life, 10; Associate Sustaining, 1; Sustaining, 2.

The following changes in membership since the last report, were presented as follows: Junior to Annual, 2; Annual to Life, 2; Annual to Sustaining, 2; Life to Associate Sustaining, 1; Associate Sustaining to Sustaining, 2; Associate Sustaining to Life, 1; Sustaining to Benefactor, 3.

During the year 1946 the Academy lost 42 members by death.

Following their nomination as prescribed by the By-Laws of the Academy, the following individuals were elected members of the Board of Trustees for the period extending to the Annual Meeting, 1950: Brandon Barringer, Cary W. Bok, Edwin G. Conklin, E. R. Fenimore Johnson, J. Percy Moore, C. M. A. Stine and George D. Widener.

The President then introduced Dr. Erling Dorf of the staff of the Academy, who addressed the meeting on the subject, "The Geologic History of the Rocky Mountains."

At the end of Dr. Dorf's address, members and guests were directed to the Reading Room of the Library, where an informal reception was held, with refreshments.

ELECTION OF OFFICERS

At a meeting of the Board of Trustees of the Academy, held March 19, 1947, the following officers were elected:

President: Charles M. B. Cadwalader

Vice President: Edwin G. Conklin

Vice President: R. Meyer de Schauensee

Treasurer: Brandon Barringer

Managing Director: H. Radclyffe Roberts

Secretary and Assistant Treasurer: John E. Bowers

Corresponding Secretary: James A. G. Rehn

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